AutoPILOT PRO

Six-Run Gas Flow Computer &
Remote Telemetry Unit
User Guide
P/N 1-0500-005

Revision G

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

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Remote Telemetry Unit

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Revision History

Revision Level	Date	Comments
A	09-2008	Initial release (ERO 6565).
B	12-2008	Revised per ECO 6718.
C	02-2009	Revised per ECO 6802.
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G	08-2011	Revised per ECO 7805.

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FCC Notification

The Thermo Scientific AutoPILOT PRO flow computer complies with part 15 of the FCC rules.

Caution The AutoPILOT PRO flow computer must be operated as supplied. Any changes or modifications made to the device without the express written approval of Thermo Fisher Scientific can void the user's authority to operate the equipment. ▲

Note This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the user manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at the user's own expense. ▲

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Chapter 1
Product Overview

General

The Thermo Scientific AutoPILOT PRO flow computer is the flagship product in the Thermo Scientific flow computer product line. The AutoPILOT PRO flow computer combines Thermo Fisher Scientific's long legacy of flow computer knowledge with all the latest technology – low power, high speed data, connectivity, and high accuracy. The functionality of the flow computer is scalable from a single run application requiring measurement only to a six-run application with full station and well head control. The flow computer also incorporates Thermo Fisher's self-tuning plunger lift algorithms that have been proven to increase natural gas production.

Basic System

The basic AutoPILOT PRO system consists of an enclosure, an external power supply, and the main board.

Enclosure

Two types of enclosures are offered with the AutoPILOT PRO flow computer. The NEMA 4X enclosure is available in fiberglass, aluminum, or stainless steel. The IP65 enclosure is available in aluminum or stainless steel. All enclosures come standard with display and keypad.

Power Supply

The standard instrument is powered by an external 10–30 Vdc power supply. The power supply is protected against high surge voltages and designed to meet UL and ATEX requirements (reference the appropriate certification tag for specific ratings).

Optionally, the instrument can be powered by an internal 12 V, 28 AH rechargeable lead acid battery.

Main Board

The main board contains the primary logic functions of the flow computer and has the following features:

- Interface to the display
- Flash memory for program storage and data storage, 2 M x 16
- SRAM memory for data storage, 1 M x 16, battery backed
- Real-time clock (RTC)
- Lithium backup battery; voltage monitor for the RTC and SRAM circuits allows for data and configuration retention in the event of power failure
- Local I/O consisting of:
  - Three analog inputs
  - One 100-ohm Pt RTD input
  - Two discrete outputs
  - Two discrete inputs
  - Two pulse inputs
  - One local Honeywell smart transducer connection
  - One local serial communication port
  - One RS232/RS485 host serial communication port
  - Connection for AutoMITTER safety interface board (SIB) for communication with multiple remote transducers controlled by a Thermo Scientific AutoMITTER PRO transmitter
  - Connection for optional modular expansion boards (MEBs)
  - Two +12 V power supply outputs for wireless communication devices: One for wireless radio and one for a Bluetooth® wireless module (future)
  - One Ethernet communication port with ESD protection for connection to the Internet
  - One USB port (future)
- Power consumption of 1 W (3.6 W with full connections)

Expansion

The capacity of the basic AutoPILOT PRO flow computer can be expanded through optional I/O boards mounted in the enclosure. See Appendix B for board specifications.

Note One AutoPILOT PRO flow computer supports up to 12 expansion boards in any combination, as long as the maximum number of boards listed below is not exceeded. ▲

Table 1–1. Maximum number of optional I/O boards per unit

I/O Board	Maximum # installed per unit
2-DI/DO MEB	6
4-DI MEB	6
4-DO MEB	6
2-PI MEB	4
2-D/A (Dual Analog Output) MEB	4
AI Expansion	Expansion option consists of 1 AI expansion board and up to 4 AI terminal boards.
Comm. Expansion Option	Expansion option consists of 1 comm. expansion board and up to 4 comm. terminal boards.
AutoMITTER SIB	1

Radio / Host Port Options

If the host communication port on the main board is not being used internally, it may be used to interface with an RS232 compatible device. The following radio and host port options are available for use with the AutoPILOT PRO flow computer:

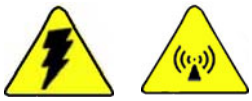
- MDS 9810 radio
- Thermo Scientific AutoWAVE radio
- Thermo Scientific 212A modem

Using this Manual

This manual provides a technical description of the product and available options, installation and mounting instructions, basic keypad operating procedures, and maintenance and troubleshooting procedures. For instructions on how to use the Thermo Scientific AutoCONFIG™ instrumentation configuration software with this instrument, refer to the AutoCONFIG software startup guide (p/n 1-0485-068) and the AutoCONFIG software help system.

The information in this manual is designed to aid personnel to correctly and safely install, operate, and / or maintain the system described; however, personnel are still responsible for considering all actions and procedures for potential hazards or conditions that may not have been anticipated in the written procedures. **If a procedure cannot be performed safely, it must not be performed until appropriate actions can be taken to ensure the safety of the equipment and personnel.** The procedures in this manual are not designed to replace or supersede required or common sense safety practices. All safety warnings listed in any documentation applicable to equipment and parts used in or with the system described in this manual must be read and understood prior to working on or with any part of the system.

The following admonitions are used throughout this manual to alert users to potential hazards or important information. **Failure to heed the warnings and cautions in this manual can lead to injury or equipment damage.**



Warning Warnings notify users of procedures, practices, conditions, etc. which may result in injury or death if not carefully observed or followed. The triangular icon displayed varies depending on the type of hazard (electrical, general). ▲

Caution Cautions notify users of operating procedures, practices, conditions, etc. which may result in equipment damage if not carefully observed or followed. ▲

Note Notes emphasize important or essential information or a statement of company policy regarding an operating procedure, practice, condition, etc. ▲

Tip Tips may also be used in this manual. They are suggestions or things to consider that will help you use the instrument or this manual. ▲

Chapter 2
Hardware Description: Basic System

The basic AutoPILOT PRO system consists of the enclosure, the power supply, and the main board.

The Enclosure

Two types of enclosures are offered with the AutoPILOT PRO flow computer. The NEMA 4X enclosure is available in fiberglass, aluminum, or stainless steel. The IP65 enclosure is available in aluminum or stainless steel. All enclosures come standard with display and keypad.

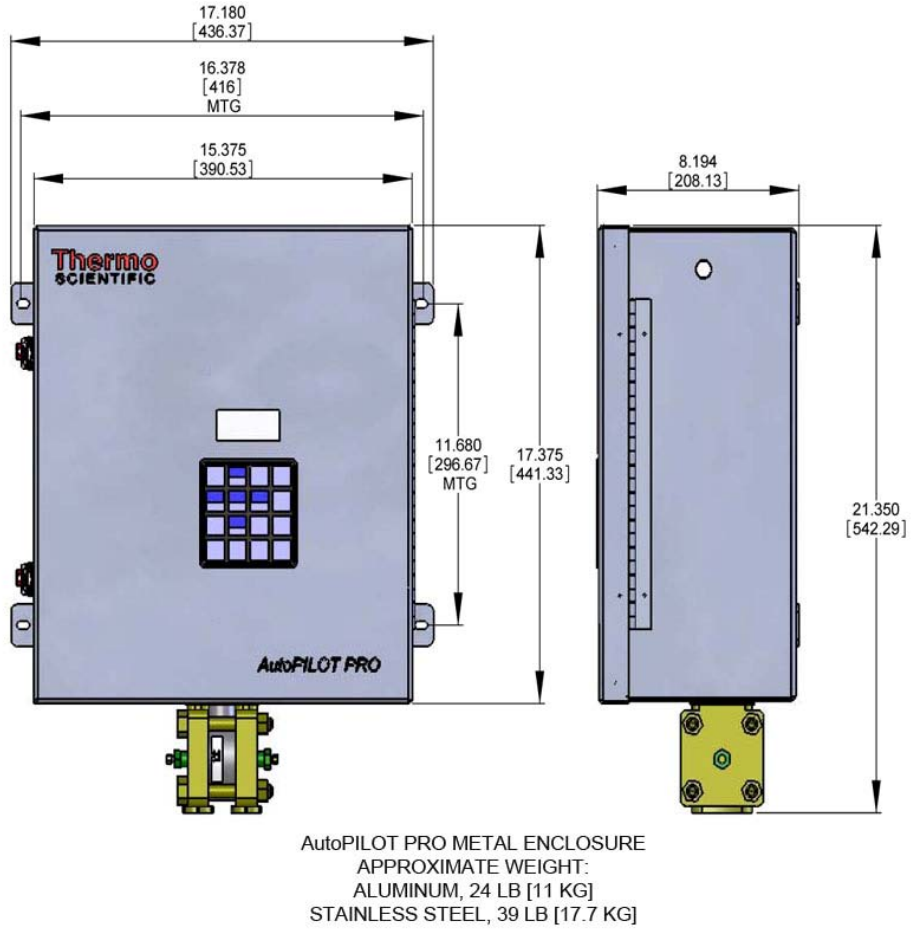


Figure 2–1. Dimensions: NEMA 4X & IP65 metal enclosures

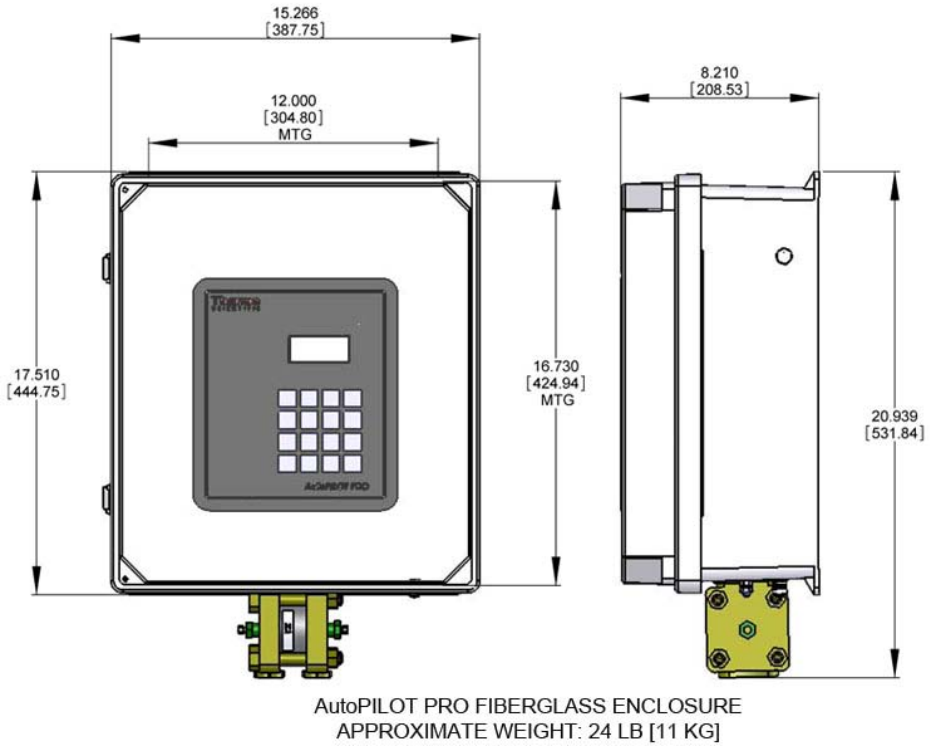


Figure 2–2. Dimensions: NEMA 4X fiberglass enclosure

Power

The standard instrument is powered by an external 10–30 Vdc power supply. Alternatively, the instrument may be powered by an internal rechargeable battery. Power is connected to the flow computer through the power distribution terminal block (TB1), located on the door panel of the enclosure.

Power consumption of the basic AutoPILOT PRO flow computer is about 1 W for a typical unit; however, overall power consumption depends upon the I/O configuration and is determined on an individual basis. Every effort has been made to keep power consumption to a minimum.

External Power Source

The voltage range of the standard external power supply is 10–30 Vdc. If a wireless radio is included in the system, the power supply should be able to provide a current greater than 2.5 A.

See Chapter 3 for installation and wiring instructions.

Internal Battery & Solar Charger Controller

If the internal battery option is used, the instrument is powered by a rechargeable battery assembly that sits in a bracket fastened to the instrument's internal bracket. This battery is charged by an external solar panel and incorporates a solar charger controller (SCC) that employs a three-state solar charger algorithm: the bulk charge, the controlled overcharge, and the float charge state.

When the battery capacity is 90% or less, the charger enters the bulk charge state, providing the maximum and constant charge current to the battery. Once the battery is close to being fully charged, the SCC enters the controlled over-charging state. In this state, the SCC over-charges the battery to ensure it is fully charged. Once the over-charging current reaches its set point, the SCC switches to the float charge state, providing moderate charging current to maintain the battery at its fully charged voltage level. The charging cycle repeats when the battery capacity drops below 90%.

The SCC internal reference voltage is characterized with a negative temperature coefficient matching that of a lead acid battery. The charger voltage is automatically adjusted. Charging voltage increases at lower ambient temperatures in order to maintain a fully charged battery. At higher ambient temperatures, charging voltage is scaled off to help extend the battery life.

The SCC dissipates its charging process heat through the main board chassis. For proper operation, the main board must be mounted on its bracket and the main board transistor Q12 must be attached to the chassis bracket by a screw (see Figure 11–1 for an illustration).

The SCC accepts up to 20 W solar panels. TB10 on the main board is the solar charger power input. For instructions on how to install the optional internal battery, refer to "Installing the Internal Battery" in Chapter 3.

Table 2–1. SCC specifications

Input solar panel voltage	12 V, 20 W max.
Output float charge voltage	~13.6 V
Output overcharge voltage	~14.7 V
Ambient temperature	-40°C to +70°C
Input reverse voltage protection	Yes
Shorted battery protection	Yes

The Main Board

A set of the illustrations provided in this chapter and additional wiring diagrams are provided in Appendix D.

Jumper Settings & Connections

The jumper settings and connector descriptions for the main board discussed in this section are provided in Appendix C.

Lithium Backup Battery

A Lithium backup battery is installed on the main board (BT1) to maintain configuration, memory, and the real-time clock when power is removed from the unit. The in-circuit connection of the Lithium battery is set by installing a jumper at J39 pins 11–12 on the main board.

Tip Loss of configuration or historical data with the backup battery jumper installed may indicate that the Lithium battery needs to be replaced. ▲

Tip The Lithium battery is a field replaceable item. Refer to "Replacing the Backup Battery" in Chapter 11 for replacement instructions. ▲

Warning The Lithium battery may explode if mistreated. Do not attempt to recharge, disassemble, or burn it. ▲

Transducer Inputs

The main board provides three analog inputs for single low-power transducers (0–5 Vdc maximum range). Other transducers with voltage output ranges such as 0.8–3.2 V or 1–5 V units may be used with software scaling provided the 0–5 V limits are not exceeded. Use of 4–20 mA current loop transmitters is not recommended for units powered from small battery sources.

The analog inputs have been evaluated as non-incendive field circuits for use with the following analog transmitters (differential pressure, static pressure, and temperature):

- Druck static pressure transmitter, Model PDCR143-8003 (25–3000 psi range)
- Rosemount® static pressure transmitter, Model 3051C Low Power (3626 psi maximum)
- Rosemount® differential pressure transmitter, Model 2024 (2000 psi maximum)
- Rosemount® differential pressure transmitter, Model 3051C Low Power (3626 psi maximum)
- Thermo Scientific RTD temperature transmitter, Model 465A

The transmitters may be connected to the flow computer using standard cabling and optional flexible conduit. All transmitters are wired to TB1 through TB3 on the main board or to analog input channels 1 through 16 on the optional analog input expansion / terminal boards. Maximum cable length between the flow computer and each transmitter is 25 feet.

Each local analog input provides transmitter power (XPWR) at a nominal +9 V that power cycles with the unit, a transmitter signal input (IN), and a transmitter power return (AGND). The analog inputs on the main board are identified in the following table.

Table 2–2. Analog inputs on the main board

Input	In	AGND	XPWR
AI1	TB1-1	TB1-2	TB1-3
AI2	TB2-1	TB2-2	TB2-3
AI3	TB3-1	TB3-2	TB3-3

The figure below shows typical connections between the low-power transmitter and local analog inputs

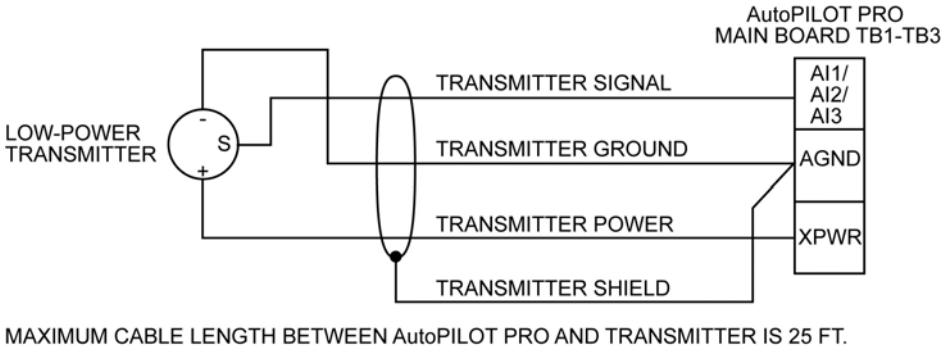


Figure 2–3. Typical analog input wiring diagram

For transmitters that cannot sleep-cycle (typically Rosemount 3051C types), configuration jumper J39 pins 7–8 must be installed on the main board to keep the flow computer and transducers in the constant power mode. Constant power mode is not recommended for operation from small power sources, including the internal 28 AH battery.

RTD Connection

TB4 on the main board is the local RTD connection. When connected to TB4, the following optional RTD probe assemblies have been evaluated as non-incendive connections if standard cabling and flexible conduit are used (maximum cable length of 25 feet):

- Thermo Scientific RTD probe assembly 3-0465-029
- Thermo Scientific RTD probe assembly 3-0465-033

Another type of RTD probe with integral metal sheathing may connect to TB4 on the main board with up to 25 feet of standard cabling between the probe body and flow computer.

Typical connections are shown below.

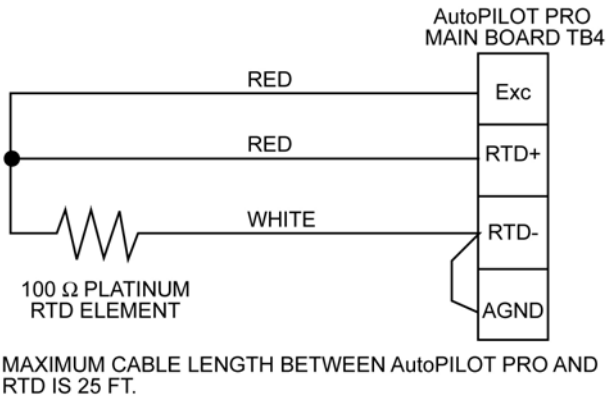


Figure 2–4. Typical RTD connections

Discrete Outputs

Two local discrete outputs are provided on the main board at TB5 to drive customer low-power output devices that are DC-resistive by nature (relays, solenoids, etc.). The discrete outputs also provide a +12 V power source at TB5 pins 1 and 3 (V_{DO}) to drive the customer's device. Each channel can provide 150 mA maximum.

Power for each discrete output may be customer supplied and is independent of the flow computer's input power. Each signal provided by the board is an open drain FET output contact closure detected as a level signal. Some optional functions, the +12 V radio power supply output (VRadio1 at TB12) for example, may require the internal use of one or more of the discrete outputs, making them unavailable for customer use. The discrete outputs on the main board are shown below.

Table 2–3. Discrete outputs on the main board

Output	SIG	GND
DO1	TB5-2	TB6-2 or TB6-4
DO2	TB5-4	TB6-2 or TB6-4
VDO (12 V)	TB5-1 or TB5-3	TB6-2 or TB6-4

The figure below shows typical discrete output wiring.

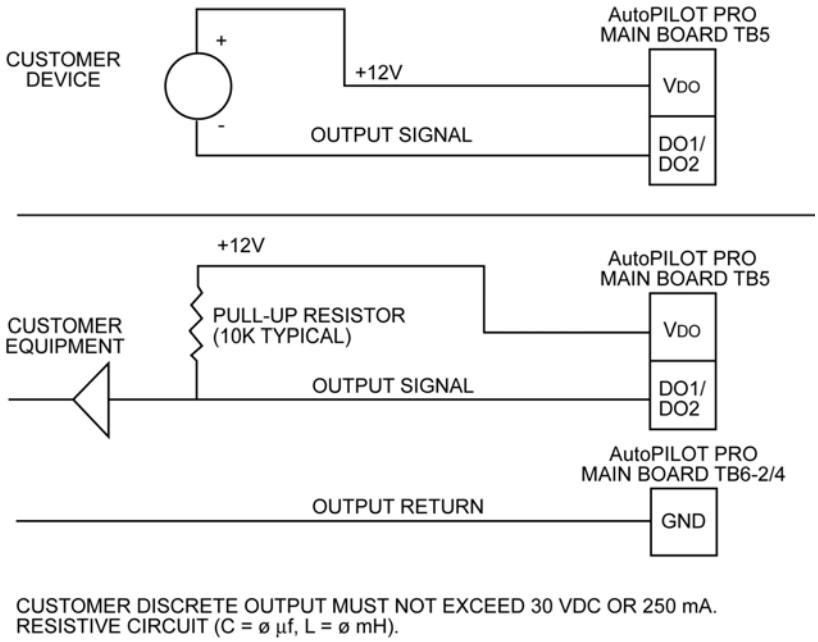


Figure 2–5. Typical discrete output wiring diagram

Discrete Inputs

Two local discrete inputs are provided on the main board at TB6 for customer input devices that are DC-resistive by nature (reed relays, uncommitted transistor outputs, etc.). The discrete inputs on the main board are identified in the following table.

Table 2–4. Discrete inputs on the main board

Input	SIG	GND
DI1	TB6-1	TB6-2
DI2	TB6-3	TB6-4

Typical discrete input wiring is shown below.

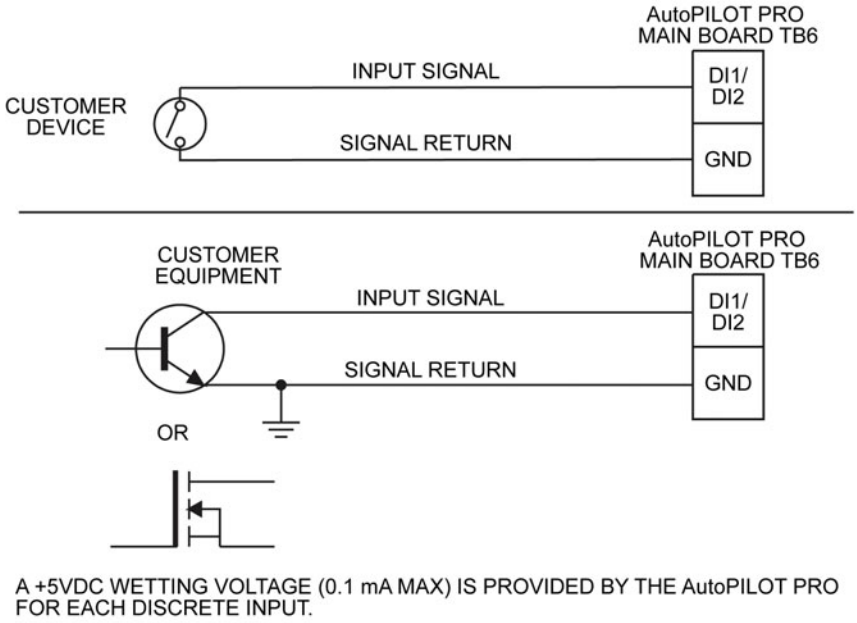


Figure 2–6. Typical discrete input wiring diagram

Pulse Inputs

The flow computer can accept two pulse inputs from customer input devices (reed switches, slot sensors, magnetic pickup, uncommitted transistor outputs, etc.).

The pulse input device must be resistive or inductive in nature only, with a maximum output of +15 V if one of the +5 Vdc pull-up modes is not selected. The pulse inputs on the main board are at TB7 and are identified in the following table.

Table 2–5. Pulse inputs on the main board

Input	SIG	GND	Switch
PI1	TB7-1	TB7-2	SW3
PI2	TB7-3	TB7-4	SW4

The figure below shows typical pulse input wiring.

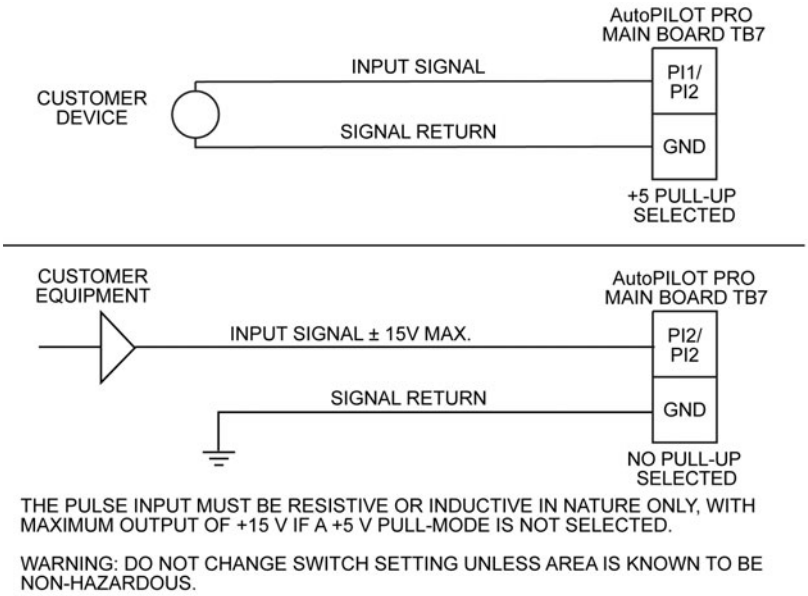


Figure 2–7. Typical pulse input wiring diagram

Each pulse input has a seven-position DIP configuration switch to select the mode of operation. The function of each switch position in the ON position is listed in the following table.

Table 2–6. Switch functions (when in the ON position)

Switch Position	Function
1	Conditioning amplifier input
2	Conditioning amplifier input bypass
3	5 Vdc pull-up (2.5 mA maximum)
4	5 Vdc pull-up (0.1 mA maximum)
5	Conditioning amplifier output
6	Conditioning amplifier output bypass
7	Debounce, 400 Hz maximum input filter

Warning Do not change switch settings unless the area is known to be non-hazardous. ▲

Typical configuration switch settings for various inputs are shown in the table below.

Table 2–7. Typical switch configurations

Input Type	Switch Positions Set to ON
Slot sensor	2, 3, 6
Magnetic	1, 5
Contact closure	2, 4, 6, 7

Local Serial Communication Port

The main board provides one RS232 compatible local communication port (TB8) for calibration and configuration of the unit using a laptop and Thermo Scientific configuration software. Connection is made through the CHIT connector mounted in the bottom of the flow computer enclosure. Thermo Fisher manufactures optional cable assemblies for this connection. They are listed below.

Table 2–8. Cable assemblies for CHIT connector

Assembly P/N	Description
3-0446-090	DB9S connecter with 15-ft cable for use with the six-position connecter
3-0446-090B	DB9S connecter with 25-ft cable for use with the six-position connecter

Radio Power Supply Output

The TB13 output is designed to provide DC power for a Bluetooth wireless module and will be available in the future. Both ports are controlled through software.

The main board provides a +12 V power source for wireless communication devices. The TB12 output is designed to provide DC power for wireless radio. Based on the system specification, the voltage range is 10–12 Vdc. The port can support 1 A current for three to five minutes of continuous radio transmission. Go to Chapter 7 for more on radio options.

Solar Charger Power Input

For the internal battery option, connect TB10 on the main board to the solar panel as shown below. For more information on the internal battery, refer to "Installing the Internal Battery" in Chapter 3.

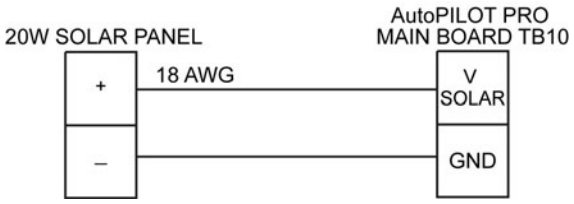


Figure 2–8. Solar panel wiring for internal battery option

System Power Supply Input

TB11 on the main board is the system power supply input. It is wired to TB1 on the door panel of the flow computer enclosure.

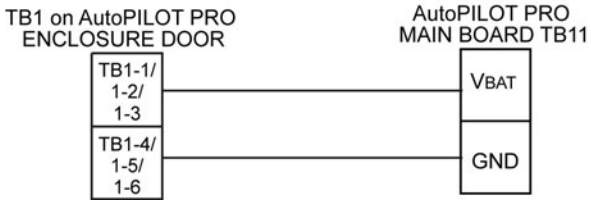


Figure 2–9. System power supply input wiring

MEB Interface

TB15 on the main board provides the connection for optional MEBs. Refer to Chapter 4 for more information.

SIB Interface

TB14 on the main board provides the connection for an AutoMITTER safety interface board (SIB). The SIB provides connections for up to four remote mounted AutoMITTER PRO transmitters. Go to Chapter 6 for more on this option.

Host Communication Port

The main board provides one RS232/RS485 host communication port (TB16), which may be wired internally to one of the communication options.

The figure below shows typical host communication port wiring.

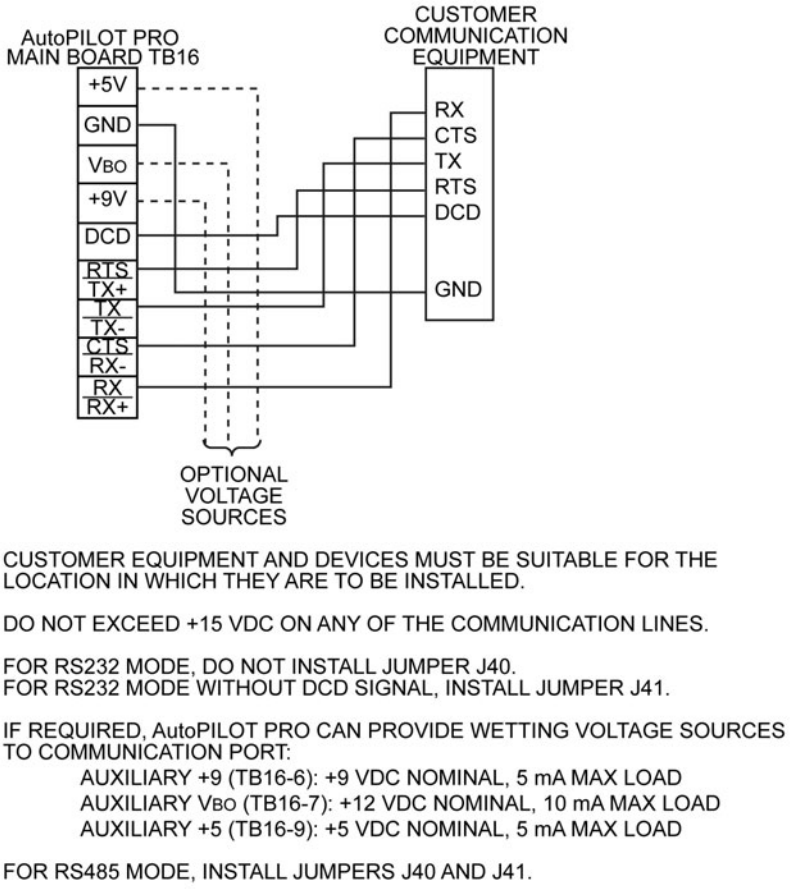


Figure 2–10. Typical host communication port wiring

RS232 Mode

If not used internally, the communication port can interface to any RS232 compatible customer device, such as a radio (see Chapter 7 for more on radio options). Do not exceed +15 Vdc on any of the communication lines. Host communication port RS232 connections are identified in the following table.

Table 2–9. Host communication port RS232 connections

Signal	TB16 on Main Board
RX (Receive)	TB16-1
CTS (Clear to Send)	TB16-2
TX (Transmit)	TB16-3
RTS (Request to Send)	TB16-4
DCD (Data Carrier Detect)	TB16-5
GND (Ground)	TB16-8

Warning Customer equipment and devices must be suitable for the location where they are to be installed. ▲

Note For RS232 mode, do not install jumper J40. ▲

Note For RS232 mode without DCD signal, install jumper J41. ▲

If required, the flow computer can provide three wetting voltage sources for the communication port:

- Auxiliary +9 (TB16-6): +9 Vdc nominal, 5 mA maximum load
- Auxiliary V_{BO} (TB16-7): +12 V voltage, 10 mA maximum load
- Auxiliary +5 (TB16-9): +5 Vdc nominal, 5 mA maximum load

RS485 Mode

The host communication port also supports RS485 communication. To use RS485 mode, jumpers J40 and J41 must be installed. Select RS485 2-wire mode by installing a jumper on J39 pins 15-16. Remove the jumper for 4-wire mode.

For better communication quality when in RS485 mode, select the termination through jumpers J34 and J37.

Ethernet Port

J10 on the main board is a 10M/100M Ethernet port that supports standard TCP/IP protocol.

Honeywell Smart Transducer Connection

A local Honeywell smart transducer can be mounted into the bottom of the flow computer enclosure. The transducer's 10-pin connector connects to J25 on the back of the main board. Refer to "Mounting the Enclosure onto the Transducer" in Chapter 3 for direct mounting instructions.

USB Port

The USB port is under development.

Chapter 3
Installing the Basic System

General

This chapter provides mounting and wiring instructions for the basic AutoPILOT PRO system. In addition to the material in this chapter, reference Appendix D for associated drawings and wiring diagrams.

Tip Installation instructions for the optional internal battery are provided at the end of this chapter. All other options are addressed in their own chapter. For example, installation of MEBs is addressed in "MEB Options" (Chapter 4). ▲

NEMA 4X / IP65

This configuration has been evaluated to conform to UL, Canadian, ATEX, and Brazilian standards. Refer to the appropriate certification tag for ratings.

For United States installations, wire all circuits connected to the flow computer (unless otherwise specifically identified) using the Class I, Div. 2 Wiring Methods specified in Article 501-4(b) of the National Electric Code, NFPA 70.

For Canadian installations, wire all circuits connected to the flow computer (unless otherwise specifically identified) using the Class I, Div. 2 Wiring Methods specified in Section 18-152 of the Canadian Electrical Code.

For European installations, wire all circuits connected to the flow computer (unless otherwise specifically identified) using methods specified in the European Standard EN60079-14.

For Brazilian installations, wire all circuits connected to the flow computer (unless otherwise specifically identified) using methods specified in IEC 60079-14.

Warning Do not make or break any connections while circuit is active. ▲

Warning Ensure the area is non-hazardous before making any connections. ▲

Warning Customer equipment and devices must be suitable for the location where they are to be installed. ▲

Mounting the Enclosure onto the Transducer

This section provides instructions on mounting the flow computer enclosure onto a transducer (direct mounting). If you do not need to do this, continue to "Pole Mounting" to mount the enclosure onto a 2-inch pole.

Mounting the enclosure directly onto a transducer requires the direct mounting kit for the enclosure and a transducer kit. The instructions below combine the documentation provided with both kits. Refer to the individual kit documentation for additional details.

Warning Ensure that power is off and the area is non-hazardous before performing this procedure. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

Caution To prevent the heavier liquid components from entering into the process heads of the flow transducer, mount the transducer above the process lines and have the impulse lines from the process slope up to the transducer or go directly up from the process lines to the transducer. ▲

Tip The instructions for mounting metal and fiberglass enclosures onto a transducer are the same. ▲

1. From the rear of the enclosure, align the direct mounting bracket with the enclosure's bottom set of mounting tabs.

2. Facing the enclosure, place a washer over one of the bottom mounting tabs. Insert the cap screw through the mounting and bracket holes. Do the same for the other side.

3. Secure the direct mounting bracket to the enclosure by placing a washer and split lock washer over the cap screw and fastening everything with a nut.

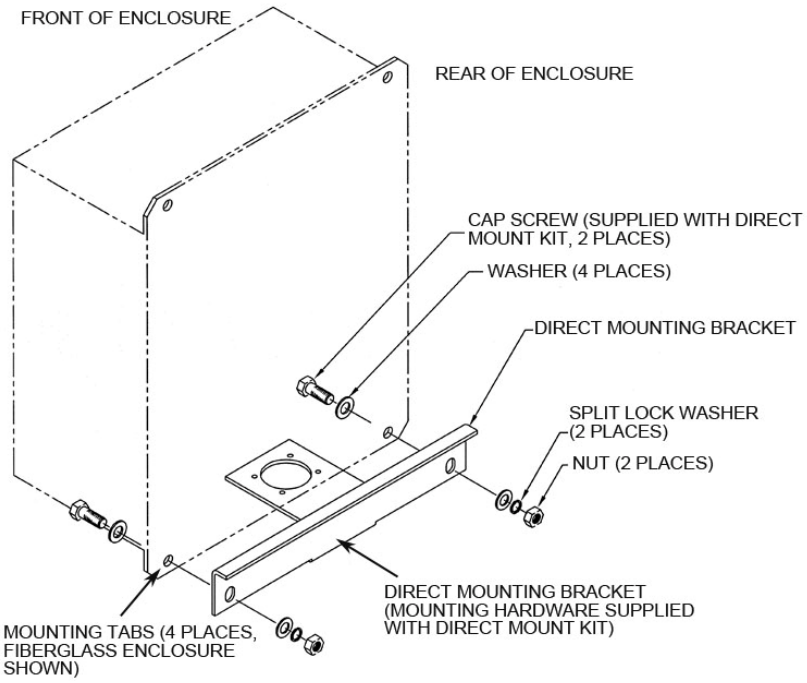

FRONT OF ENCLOSURE
REAR OF ENCLOSURE
CAP SCREW (SUPPLIED WITH DIRECT MOUNT KIT, 2 PLACES)
WASHER (4 PLACES)
DIRECT MOUNTING BRACKET
SPLIT LOCK WASHER (2 PLACES)
NUT (2 PLACES)
DIRECT MOUNTING BRACKET (MOUNTING HARDWARE SUPPLIED WITH DIRECT MOUNT KIT)
MOUNTING TABS (4 PLACES, FIBERGLASS ENCLOSURE SHOWN)

Figure 3–1. Direct mounting steps 1–3 (fiberglass enclosure shown)

4. Install the transducer mounting bracket onto the transducer, and install the transducer grommet over the bracket.

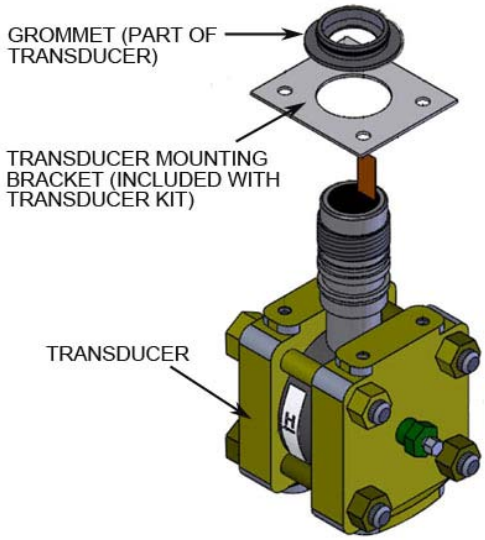


Figure 3–2. Direct mounting step 4

5. Orient the transducer so that the "H" tag is facing the same direction as the front of the flow computer enclosure. Open the enclosure door, and insert the transducer into the bottom of the enclosure.

6. Secure the transducer to the enclosure using the sealing washers and bolts.

Note Before tightening the bolts, connect the ground wire to the bolt closest to the ground lug in the enclosure. ▲

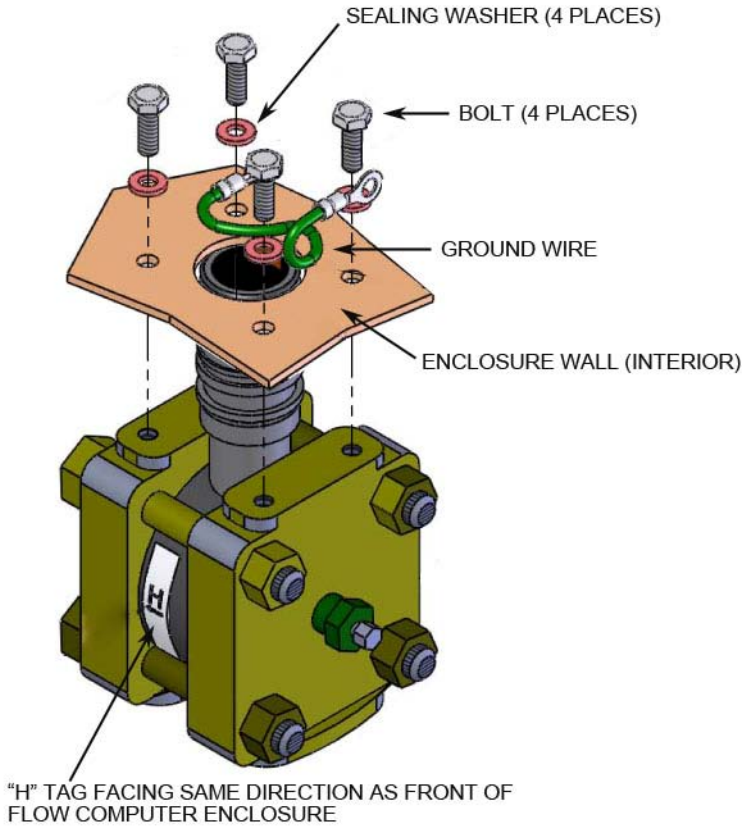

SEALING WASHER (4 PLACES)
BOLT (4 PLACES)
GROUND WIRE
ENCLOSURE WALL (INTERIOR)
"H" TAG FACING SAME DIRECTION AS FRONT OF FLOW COMPUTER ENCLOSURE

Figure 3–3. Direct mounting steps 5–6

7. Connect the ground wire to the ground lug in the enclosure.

8. Loosen the thumbscrews on the mounting bracket, and lift the main board and mounting bracket up. Route the transducer cable through the opening in the mounting bracket that provides access to J25 on the back of the main board. If necessary, remove the bracket over the opening, route the cable, and then replace the bracket. Connect the transducer cable to J25 on the main board. (J25 is shown in Figure C–2.)

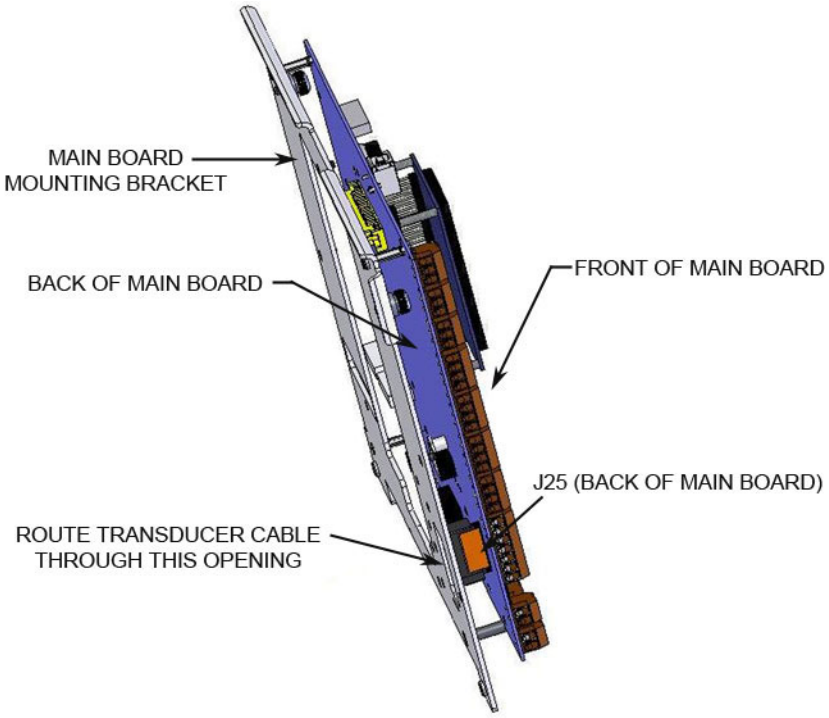


Figure 3–4. Direct mounting step 8

9. Return the main board and mounting bracket to the down position, and shut the enclosure door.

Pole Mounting

It is assumed that the solar panel is already mounted and that only the external power supply (if applicable) and flow computer enclosure need to be mounted.

External Power Supply

The enclosure for the external battery comes with the pole mounting channels installed.

Warning Ensure that power is off and the area is non-hazardous before performing this procedure. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

To mount the external battery assembly:

1. Install the two pipe clamps onto the pole using the hardware provided.

2. Align the mounting channels on the enclosure with the grooves on the pipe clamps, and slide the enclosure onto the clamps.

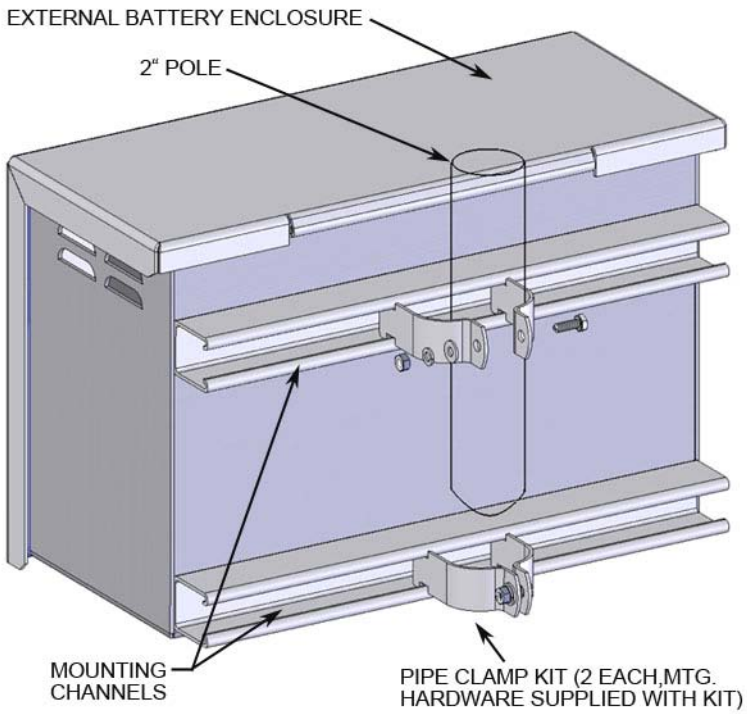


Figure 3–5. Mounting the external battery enclosure

Flow Computer Enclosure

Refer to the following instructions for mounting the flow computer enclosure onto a 2-inch pole.

Warning Ensure that power is off and the area is non-hazardous before performing this procedure. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

Tip Pole mounting instructions for metal and fiberglass enclosures are the same. ▲

1. With the enclosure upright, align the holes of one mounting channel with the top set of mounting tabs on the enclosure.

2. Facing the front of the enclosure, align one flat washer with one mounting tab, and insert a cap screw through the mounting tab and the mounting channel.

3. Facing the rear of the enclosure, place a flat washer and lock washer over the cap screw, and fasten with a nut.

4. Repeat steps 2–3 for the other side of the mounting channel.

5. Align the holes of the second mounting channel with the bottom set of mounting tabs, and repeat steps 2–3 to secure it to the enclosure.

Tip If the enclosure is mounted onto a transducer, you will need to remove the washers, split lock washers, and nuts securing the direct mounting bracket to the enclosure. Install the mounting channel onto the direct mounting bracket. Secure everything with the hardware you removed. There will be two extra flat washers, lock washers, and cap screws. ▲

6. On the pole, install the two pipe clamps using the hardware provided.

7. Align the mounting channels on the enclosure with the grooves on the pipe clamps, and slide the enclosure onto the clamps.

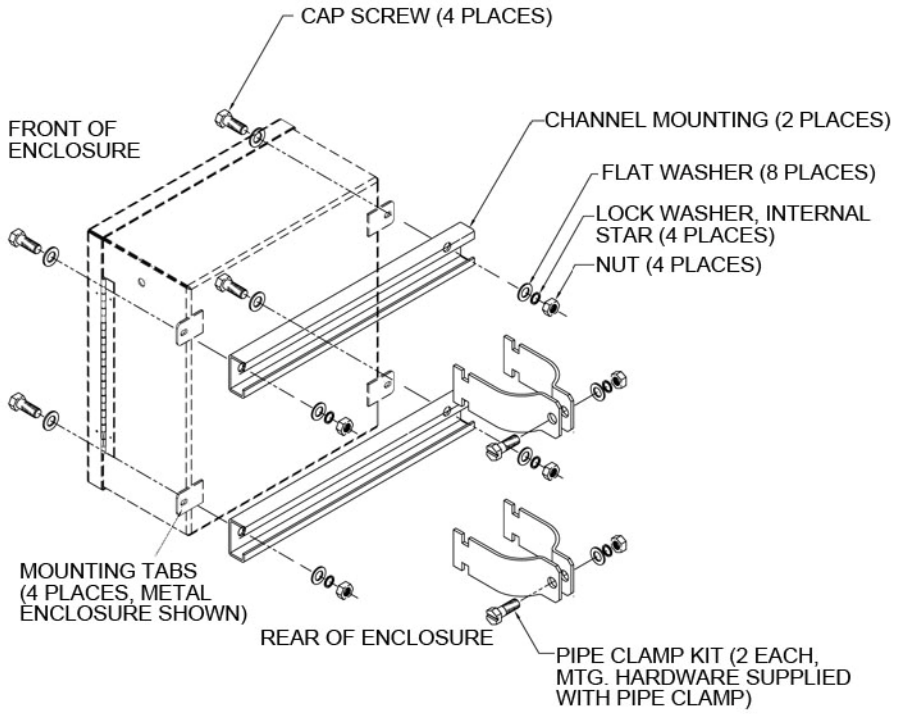

CAP SCREW (4 PLACES)
FRONT OF ENCLOSURE
CHANNEL MOUNTING (2 PLACES)
FLAT WASHER (8 PLACES)
LOCK WASHER, INTERNAL STAR (4 PLACES)
NUT (4 PLACES)
MOUNTING TABS (4 PLACES, METAL ENCLOSURE SHOWN)
REAR OF ENCLOSURE
PIPE CLAMP KIT (2 EACH, MTG. HARDWARE SUPPLIED WITH PIPE CLAMP)

Figure 3–6. Mounting the flow computer enclosure on 2" pole (metal enclosure shown)

Wiring

This section provides wiring instructions for the flow computer and the external battery (10–30 Vdc power supply).

Warning Ensure power is off and the area is non-hazardous before making any connections. ▲

Warning Use wires suitable for at least 90°C. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

1. Remove the shipping plugs from the cable entry holes in both enclosures. Open the doors of both enclosures.

2. **Connect the ground stud on the flow computer enclosure to earth ground before making any other connections.** The ground stud is located on the bottom of the enclosure and is marked with the ground symbol. Use a minimum of 12 AWG stranded wire and a length as short as possible.

3. TB11 on the main board is the system power supply input. It is wired to TB1 on the door panel of the flow computer enclosure. These connections are shown below.

   Table 3–1. TB11 to TB1 connections

Color	TB11 on Main Board	TB1 on Enclosure Door
Black	TB11-2 (GND)	TB1 positions 4–6 (NEG)
Red	TB11-1 (V_{BAT})	TB1 positions 1–3 (POS)

4. Route the power line from the external battery to the flow computer. The positive leg of the external battery must be protected with a 5 A current limiting device.

5. Connect the battery to TB1 on the enclosure door panel as shown in the table below.

   Table 3–2. External battery to TB1 connections

Color	External Battery	TB1 on Enclosure Door
Black	Negative	TB1 positions 4–6 (NEG)
Red	Positive	TB1 positions 1–3 (POS)

6. Connect the solar panel to the battery's terminal block as shown in the following table.

   Table 3–3. Solar panel to external battery terminal block connections

Color	Solar Panel	External Battery Terminal Block
Black	Negative	Position 4
Red	Positive	Position 5

Note The regulator is wired to the battery terminal block at the factory. No customer wiring is necessary. ▲

7. Shut both enclosure doors.

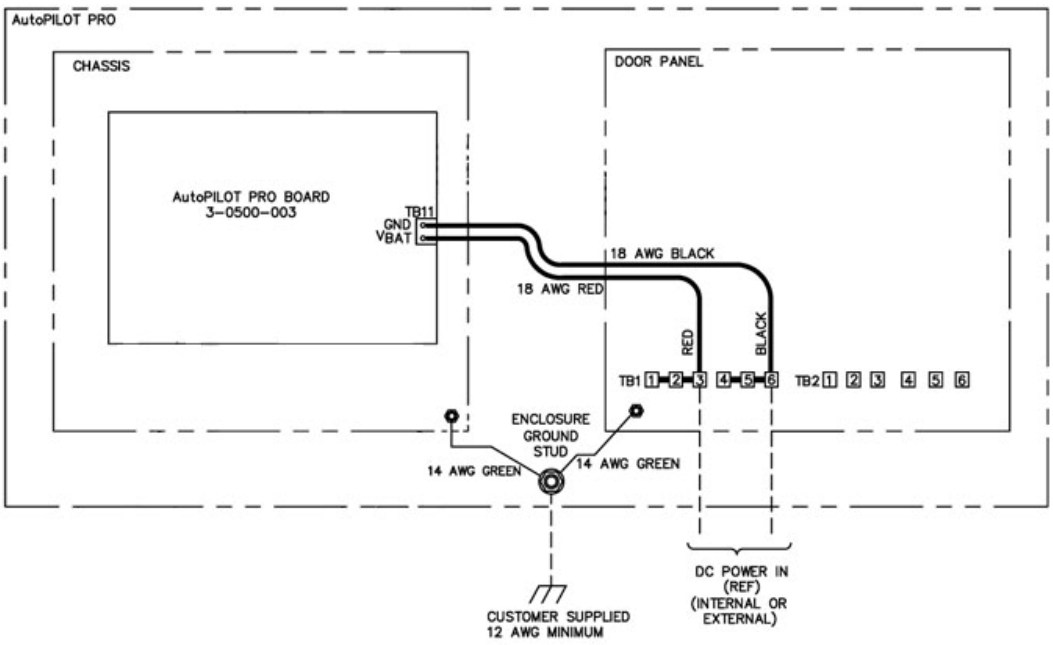


Figure 3–7. Basic system wiring (ground stud and power supply)

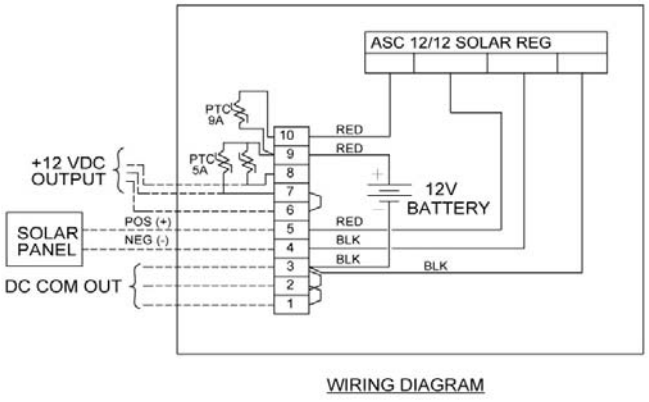


Figure 3–8. External battery with ASC regulator wiring

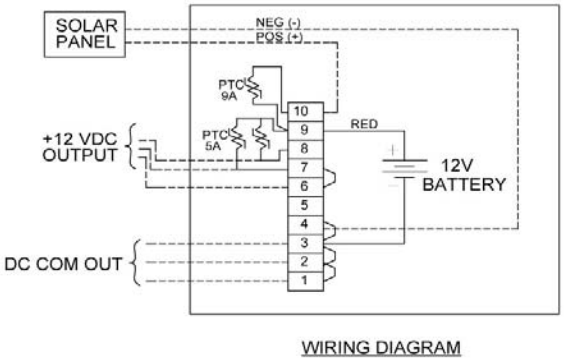


Figure 3–9. External battery wiring

Installing the Internal Battery

With the internal battery option, the instrument is powered by a 12 V, 28 AH rechargeable lead acid battery. The battery assembly consists of the battery (customer supplied) and the battery bracket kit.

Warning Ensure power is off and the area is non-hazardous before making any connections. ▲

Warning Use wires suitable for at least 90°C. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

Warning When used in hazardous locations, only the Power Sonic PS-12280 battery may be installed. ▲

Note The internal battery option cannot be used with the 212A modem option. ▲

1. Open the flow computer enclosure. Lift the main board and mounting bracket to expose the chassis bracket.

2. Refer to the general assembly drawing for internal battery assembly orientation and mounting location in the enclosure.

3. Refer to Figure 3–10 for the following:

   a. Place one star lock washer over the mounting holes in the chassis bracket, and install the standoffs.

   b. Fit the battery between the standoffs. Align the holes on the battery retainer with the standoffs, and secure the retainer with the screws and lock washers.

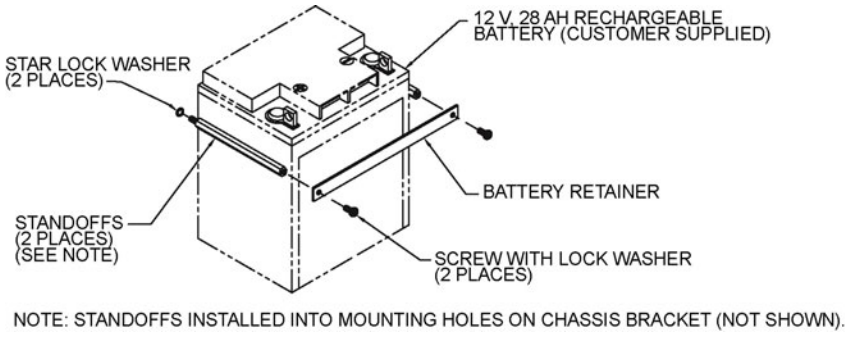

12 V, 28 AH RECHARGEABLE BATTERY (CUSTOMER SUPPLIED)
STAR LOCK WASHER (2 PLACES)
BATTERY RETAINER
STANDOFFS (2 PLACES) (SEE NOTE)
SCREW WITH LOCK WASHER (2 PLACES)
NOTE: STANDOFFS INSTALLED INTO MOUNTING HOLES ON CHASSIS BRACKET (NOT SHOWN).

Figure 3–10. Bracket for internal battery

4. Connect the solar charger input (TB10 on the main board) to the solar panel as shown in the following table.

Table 3–4. TB10 to solar panel connections

Color	TB10 on Main Board	Solar Panel
Black	TB10-2 (GND)	- (NEG)
Red	TB10-1 (VSOLAR)	+ (POS)

5. Connect the internal battery to TB1 on the enclosure door panel as shown below.

Table 3–5. Internal battery to TB1 connections

Color	Internal Battery	TB1 on Enclosure Door
Black	- (negative leg)	TB1 positions 4–6 (NEG)
Red	+ (positive leg)	TB1 positions 1–3 (POS)

6. Return the main board and mounting bracket to the down position, and shut the enclosure door.

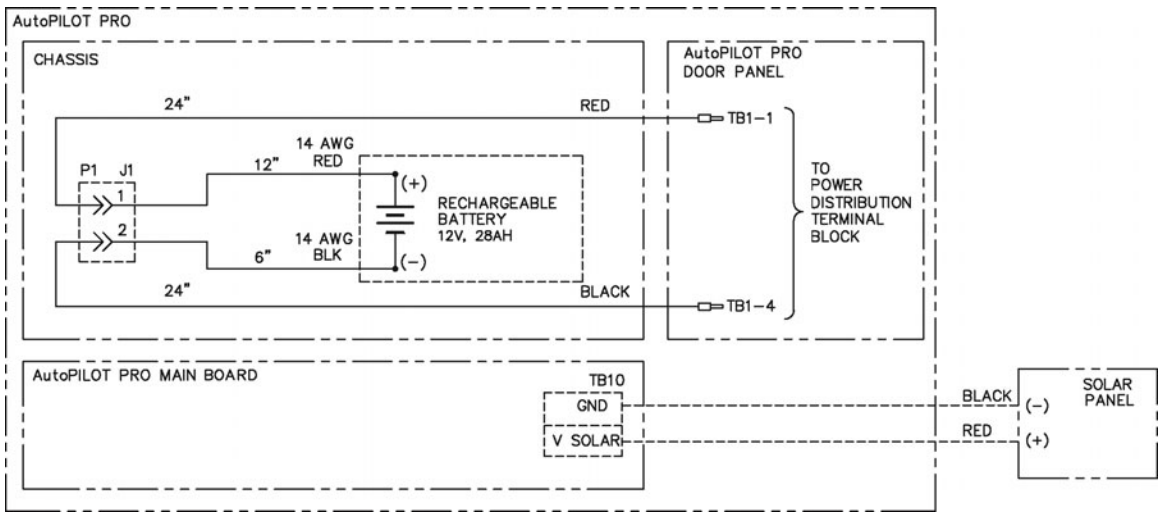


Figure 3–11. Internal battery option wiring diagram

Hazardous Area Installations

The AutoPILOT PRO flow computer has been designed to satisfy the requirements of Clause 1.2.7 of the essential Health and Safety Requirements such that it will not give rise to physical injury when handled properly. The instrument does not produce excessive surface temperature, nor does it emit infra red, electromagnetic, or ionizing radiation.

Before starting installation work, ensure all power connections are isolated and take precautions to prevent power from being restored while work is taking place. Hazardous area installations forbid the use of tools or equipment that could produce an explosion hazard by causing a spark or imposing excessive mechanical stress.

The instrument must be installed in a manner to avoid exposure to thermal or mechanically induced stresses, and in addition, the instrument should not be exposed to chemically aggressive substances beyond the expected levels. The instrument is not intended to be exposed to significant conditions of dust buildup.

Caution Aggressive substances may require extra protection. ▲

In cases where impact or other mechanical forces may be expected, appropriate methods of protection must be used. Additional protection may be required if the flow computer is to be installed in locations where it may be subject to damage.

Where the equipment may be exposes to excessive external stresses, e.g. vibration, heat, impact, the equipment must be protected by additional means of protection.

When the flow computer is operated in a hazardous environment, the system must be turned off before any board can be removed or installed.

If this is equipment is not utilized in a manner specified by the manufacturer, the protection of the equipment may be impaired.

Marking

The AutoPILOT PRO flow computer is marked for use in hazardous areas in accordance with the ATEX Directive. It is marked as follows.

Note NNNN is the notified body number of the notified body issuing the current quality assurance notification certificate, e.g. 1712 = Epsilon. ▲

With AutoMITTER SIB option

[EPSILON 08 ATEX 2440X] II 3 (1) G Ex nL [ia] IIB T4

Installed in the hazardous area

[EPSILON 08 ATEX 2440X] is marked on the label as shown below.

Thermo Fisher Scientific
Sugar Land, Texas 77478
AutoPILOT PRO
MODEL NO:
SERIAL NO:
VOLTS: 10 - 30 VDC
AMPS: 5A
COMPLIANCES:
NNNN
EPSILON 08 ATEX 2440X
II 3 (1) G Ex nL [ia] IIB T4
(Tamb -40°C TO +80°C)
I.S. PARAMETERS FOR EACH SEPERATE CHANNEL FROM TB3
AND TB4; Po = 0.92W Uo = 7.14V Co = 240µF
Ci = 0 Io = 2,404A - Transient Lo = 24,6µH
Li = 0 Io = 136mA - Continous Lo/Ro = 33µH/Ohm
INPUT PARAMETERS AT TB1 AND TB2: Ui = 7.14V
WARNING
DO NOT OPEN WHEN
ENERGIZED UNLESS THE AREA
IS KNOW TO BE NON HAZARDOUS
4-0500-103

Figure 3–12. Flow computer certification tag with AutoMITTER SIB option

Without AutoMITTER SIB option

[EPSILON 08 ATEX 2440X] II 3 G Ex nL IIB T4

Installed in the hazardous area

[EPSILON 08 ATEX 2440X] is marked on the label as shown below.

Figure 3–13. Flow computer certification tag without AutoMITTER SIB option

The AutoPILOT PRO flow computer is marked for use in hazardous areas in accordance with Brazilian standards. It is marked as follows.

[TÜV 11.0076X] Ex nL IIB T4 Gc

Installed in the hazardous area

[TÜV 11.0076X] is marked on the label as shown below.

Figure 3–14. Flow computer certification tag for hazardous area (Brazil)

Repair

In the event of a fault condition, the AutoPILOT PRO flow computer cannot be serviced by the customer. No repair to faulty assemblies should be attempted. Faulty assemblies must be replaced with identical replacements. All repairs or part replacements must be done by Thermo Fisher or its appointed repair agent. Contact Thermo Fisher for instructions.

Chapter 4
MEB Options

General

The AutoPILOT PRO hardware is designed to provide a high degree of flexibility in configuring a unit to match the specific installation site. This flexibility is provided using several levels of expansion, such as Thermo Scientific modular expansion boards (MEBs).

In addition to the material in this chapter, reference associated drawings, such as the flow computer general assembly drawing and detailed wiring diagrams, in Appendix D.

Warning Ensure power is off and the area is non-hazardous before making any connections. ▲

Warning Use wires suitable for at least 90°C. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

Note It is assumed that the ground stud at the bottom of the flow computer enclosure has been connected to earth ground. See step 2 in the wiring section of Chapter 3. ▲

MEB Interface Connections

On the main board, TB15 is for MEB interface connections to the MEB terminal block (TB2) on the enclosure door panel. Connections are shown in the following table.

Table 4–1. TB15 to TB2 connections

Color	TB15 on Main Board	TB2 on Enclosure Door
Green	TB15-4 (GND)	TB2-6 (GND)
White	TB15-3 (SCL)	TB2-5 (SCL)
Yellow	TB15-2 (SDA)	TB2-4 (SDA)
Blue	TB15-1 (VCC)	TB2-3 (VCC)

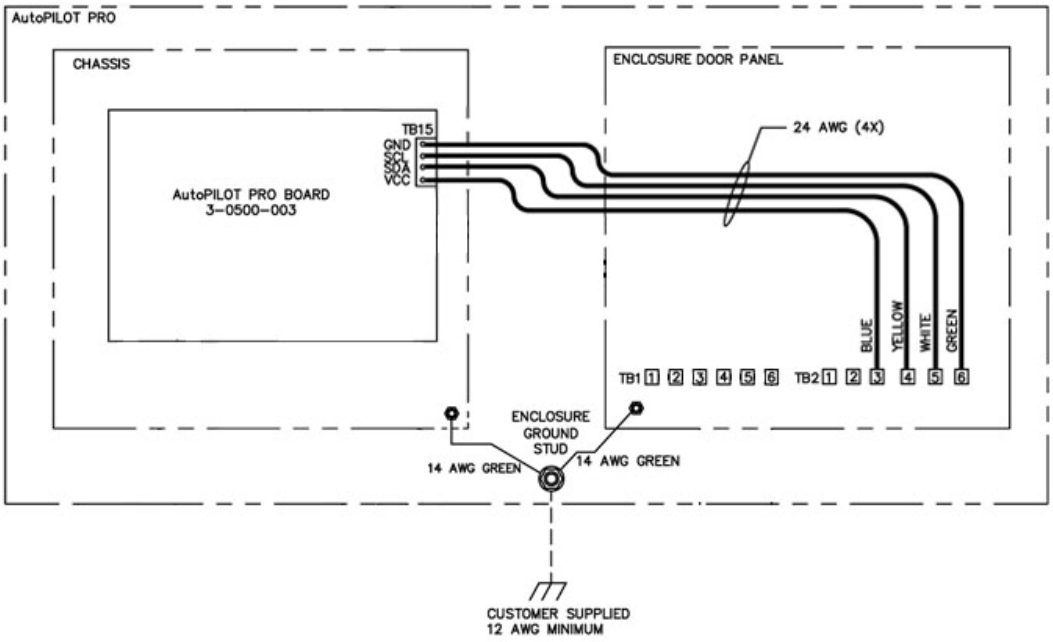


Figure 4–1. Wiring diagram for TB15 on main board to TB2 on enclosure door

Location of MEBs in the Enclosure

One AutoPILOT PRO flow computer supports up to 10 MEBs in any combination, as long as the maximum number of boards listed in the table below is not exceeded.

Table 4–2.

Order of Installation	MEB	Max. # of Boards per Unit
1	12/24 Vdc converter	1
2	2-DI/DO	6
3	4-DI	6
4	4-DO	6
5	2-PI	4
6	2-D/A	4

(Go to Appendix A for MEB part numbers and kit information.)

MEBs may be installed in three locations within the enclosure. They are stacked in a location using standoffs. Each location has a limit to the number of MEBs that may be installed. This is illustrated in Figure 4–2.

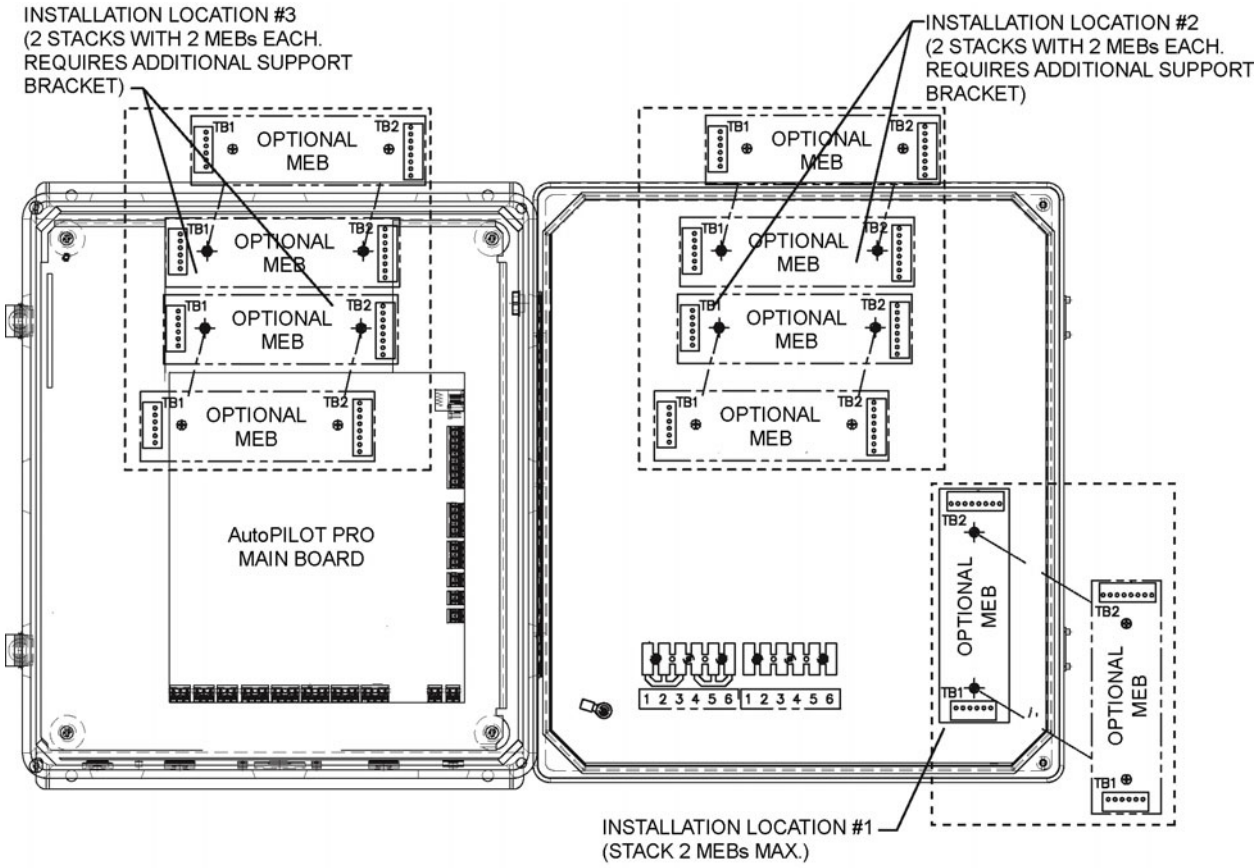


Figure 4–2. Installation locations for MEBs

Installation

To install an MEB, follow these steps.

Tip If installing the MEB at installation location #3 shown in Figure 4–2, you will need to lift the main board and mounting bracket up to access the mounting studs. ▲

1. Ensure power is off and the area is non-hazardous.
2. Open the enclosure door. Referencing Figure 4–2, locate the mounting studs you will be using for this MEB.
3. If you are mounting the MEB onto an MEB that is already installed, go to step 6. If not, install a star lock washer and 3/8-inch standoff onto each mounting stud. See “A” in Figure 4–3.
4. Install the MEB onto the standoffs.
5. Install a star lock washer and 3/4-inch standoff to secure the MEB. See “B” in Figure 4–3.
6. If you are mounting the MEB onto an MEB that is already installed, place the MEB over the standoffs, and then secure it with a star lock washer and 1/4-inch standoff. See “C” in Figure 4–3.
7. Referencing the appropriate section of this chapter, wire the MEB as required.
8. If necessary, return the main board and mounting bracket to the down position.
9. Shut the enclosure door.

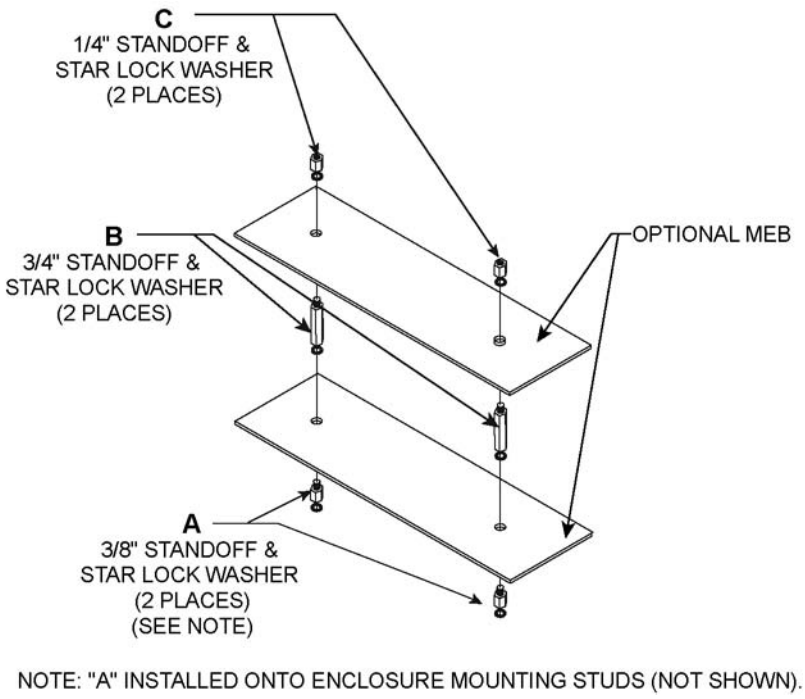


Figure 4–3. MEB installation

2-DI/DO MEB

With the optional 2-DI/DO MEB installed, the flow computer provides two discrete inputs for customer input devices such as reed relays and uncommitted transistor outputs and two discrete outputs to drive customer low-power output devices such as relays and solenoids. Customer devices must be DC-resistive in nature. Up to six 2-DI/DO boards may be installed in the unit.

Address Jumpers

A unique address that determines the software configuration must be set using jumpers J1 through J3 for each 2-DI/DO MEB installed. The address jumpers are configured as shown in the table below.

Table 4–3. Address jumper configuration for 2-DI/DO MEB

Board #	J3	J2	J1
1	Not installed	Not installed	Not installed
2	Not installed	Not installed	Installed
3	Not installed	Installed	Not installed
4	Not installed	Installed	Installed
5	Installed	Not installed	Not installed
6	Installed	Not installed	Installed

Connection to MEB Terminal Block

After installing the MEB according to "Installation" earlier in this chapter, connect TB1 on the 2-DI/DO MEB to the MEB terminal block (TB2) on the enclosure door panel as shown below.

Table 4–4. 2-DI/DO MEB to TB2 connections

Color	TB1 on 2-DI/DO MEB	TB2 on Enclosure Door
Blue	TB1-2 (+5V)	TB2-3 (VCC)
Yellow	TB1-3 (SDA)	TB2-4 (SDA)
White	TB1-4 (SCL)	TB2-5 (SCL)

Discrete Inputs

The discrete inputs are identified in the following table.

Table 4–5. Discrete inputs on the 2-DI/DO MEB

Input	SIG	GND
DI1	TB2-6	TB2-7
DI2	TB2-8	TB2-9

The figure below shows typical discrete input wiring for the MEB (see 3-0500-066 for a detailed wiring diagram).

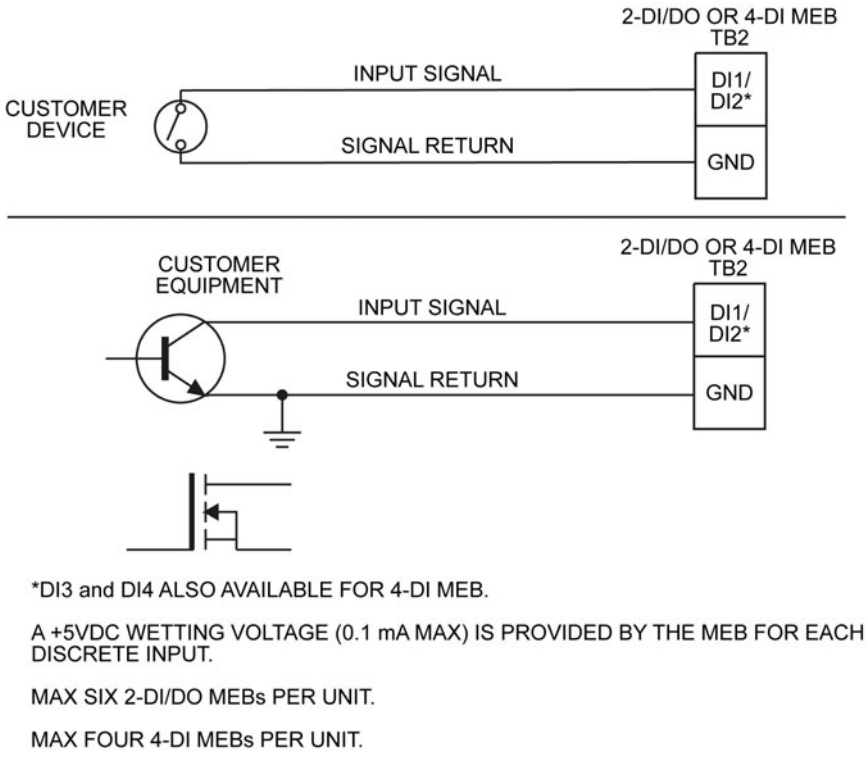


Figure 4–4. Typical discrete input wiring for 2-DI/DO or 4-DI MEB

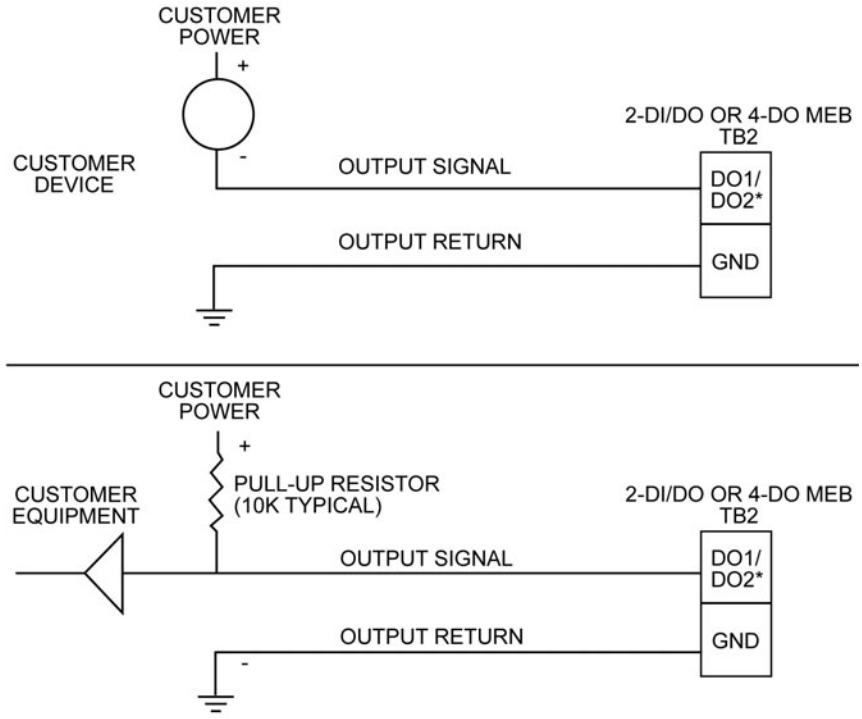
Discrete Outputs

Power for each discrete output is customer supplied and is independent of the flow computer's input power, unless it is connected to an internal board. Each signal provided by the board is an open drain FET output contact closure detected as a level signal. Some optional boards may require the internal use of one or more of the discrete outputs, making them unavailable. The discrete outputs are identified in the table below.

Table 4–6. Discrete outputs on the 2-DI/DO MEB

Output	SIG	GND
DO1	TB2-2	TB2-3
DO2	TB2-4	TB2-5

The following figure shows typical discrete output wiring for the MEB (see 3-0500-066 for a detailed wiring diagram).



*DO3 AND DO4 ALSO AVAILABLE FOR 4-DO MEB.

CUSTOMER DISCRETE OUTPUT MUST NOT EXCEED 30 VDC OR 250 mA.
RESISTIVE CIRCUIT (C = ø µf, L = ø mH).

MAX SIX 2-DI/DO MEBs PER UNIT.

MAX FOUR 4-DO MEBs PER UNIT.

Figure 4–5. Typical discrete output wiring for 2-DI/DO or 4-DO MEB

4-DI MEB

With the optional 4-DI MEB installed, the flow computer provides four discrete inputs for customer input devices such as reed relays, uncommitted transistor outputs, and other devices that are DC-resistive in nature. Up to six boards may be installed in the unit.

Address Jumpers

A unique address that determines the software configuration must be set using jumpers J1 through J3 for each 4-DI MEB installed. The address jumpers are configured as shown in the table below.

Table 4–7. Address jumper configuration for 4-DI MEB

Board #	J3	J2	J1
1	Not installed	Not installed	Not installed
2	Not installed	Not installed	Installed
3	Not installed	Installed	Not installed
4	Not installed	Installed	Installed
5	Installed	Not installed	Not installed
6	Installed	Not installed	Installed

Connection to MEB Terminal Block

After installing the MEB according to "Installation" earlier in this chapter, connect TB1 on the 4-DI MEB to the MEB terminal block (TB2) on the enclosure door panel as shown below.

Table 4–8. 4-DI MEB to TB2 connections

Color	TB1 on 4-DI MEB	TB2 on Enclosure Door
Blue	TB1-2 (+5V)	TB2-3 (VCC)
Yellow	TB1-3 (SDA)	TB2-4 (SDA)
White	TB1-4 (SCL)	TB2-5 (SCL)

Discrete Inputs

The discrete inputs are identified in the following table. Refer to Figure 4–4 for typical discrete input wiring (see 3-0500-067 for a detailed wiring diagram).

Table 4–9. Discrete inputs on the 4-DI MEB

Input	SIG	GND
DI1	TB2-2	TB2-3
DI2	TB2-4	TB2-5
DI3	TB2-6	TB2-7
DI4	TB2-8	TB2-9

4-DO MEB

With the optional 4-DO MEB installed, the flow computer provides four discrete outputs to drive customer low-power output devices such as relays, solenoids, and other devices that are DC-resistive in nature. Up to six boards may be installed in the unit.

Address Jumpers

A unique address that determines the software configuration must be set using jumpers J1 through J3 for each 4-DO MEB installed. The address jumpers are configured as shown in the table below.

Table 4–10. Address jumper configuration for 4-DO MEB

Board #	J3	J2	J1
1	Not installed	Not installed	Not installed
2	Not installed	Not installed	Installed
3	Not installed	Installed	Not installed
4	Not installed	Installed	Installed
5	Installed	Not installed	Not installed
6	Installed	Not installed	Installed

Connection to MEB Terminal Block

After installing the MEB according to "Installation" earlier in this chapter, connect TB1 on the 4-DO MEB to the MEB terminal block (TB2) on the enclosure door panel as shown below.

Table 4–11. 4-DO MEB to TB2 connections

Color	TB1 on 4-DO MEB	TB2 on Enclosure Door
Blue	TB1-2 (+5V)	TB2-3 (VCC)
Yellow	TB1-3 (SDA)	TB2-4 (SDA)
White	TB1-4 (SCL)	TB2-5 (SCL)

Discrete Outputs

Power for each discrete output is customer supplied and is independent of the flow computer's input power, unless it is connected to an internal board. Each signal provided by the board is an open drain FET output contact closure detected as a level signal. Some optional boards may require the internal use of one or more of the discrete outputs, making them unavailable for use.

The discrete outputs are identified in the following table. Refer to Figure 4–5 for typical discrete output wiring for the MEB (see 3-0500-068 for a detailed wiring diagram).

Table 4–12. Discrete outputs on the 4-DO MEB

Input	SIG	GND
DO1	TB2-2	TB2-3
DO2	TB2-4	TB2-5
DO3	TB2-6	TB2-7
DO4	TB2-8	TB2-9

2-PI MEB

With the 2-PI MEB installed, the flow computer will accept two pulse inputs from customer input devices such as reed switches, slot sensors, magnetic pick-up, and uncommitted transistor outputs. Up to four boards may be installed in the unit.

Address Jumpers

A unique address that determines the software configuration must be set using jumpers JP1 and JP2 for each 2-PI MEB installed. The address jumpers are configured as shown in the table below.

Table 4–13. Address jumper configuration for 2-PI MEB

Board #	JP1	JP2
1	Not installed	Not installed
2	Not installed	Installed
3	Installed	Not installed
4	Installed	Installed

Connection to MEB Terminal Block

After installing the MEB according to "Installation" earlier in this chapter, connect TB2 on the 2-PI MEB to the MEB terminal block (TB2) on the enclosure door panel as shown below.

Table 4–14. 2-PI MEB to TB2 connections

Color	TB2 on 2-PI MEB	TB2 on Enclosure Door
Blue	TB2-3 (+5V)	TB2-3 (VCC)
Yellow	TB2-2 (SDA)	TB2-4 (SDA)
White	TB2-1 (SCL)	TB2-5 (SCL)

Pulse Inputs

The pulse input device must be resistive or inductive in nature only, with a maximum output of ±15 volts if one of the +5 Vdc pull-up modes is not selected. Pulse inputs are identified in the following table.

Table 4–15. Pulse inputs on the 2-PI MEB

Input	SIG	GND	Switch
PI1	TB3-1	TB3-2	SW2
PI2	TB3-3	TB3-4	SW1

Typical pulse input wiring for the 2-PI MEB is shown below (see 3-0500-069 for a detailed wiring diagram).

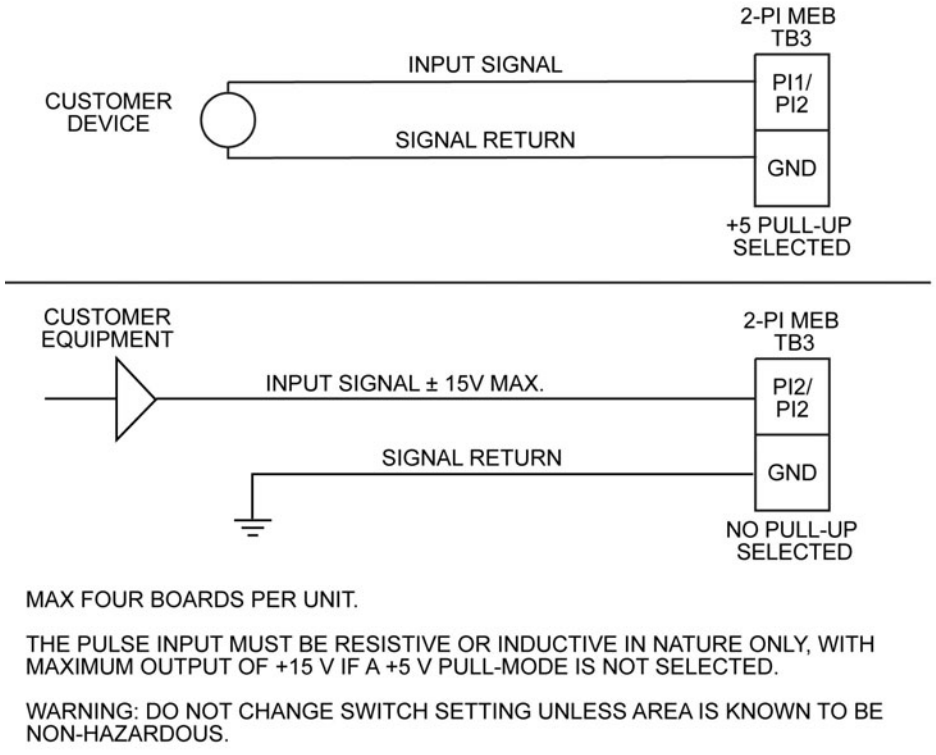


Figure 4–6. Typical pulse input wiring for 2-PI MEB

Switch Configurations

Each pulse input has a seven-position DIP configuration switch to select the mode of operation. The function of each switch position in the ON position is listed in the following table.

Table 4–16. Switch functions (when in the ON position) for the 2-PI MEB

Switch Position	Function
1	Conditioning amplifier input
2	Conditioning amplifier input bypass
3	5 Vdc pull-up (2.5 mA maximum)
4	5 Vdc pull-up (0.1 mA maximum)
5	Conditioning amplifier output
6	Conditioning amplifier output bypass
7	Debounce, 400 Hz maximum input filter

Warning Do not change switch settings unless the area is known to be non-hazardous. ▲

Typical configuration switch settings for various inputs are shown below.

Table 4–17. Typical switch configurations for the 2-PI MEB

Input Type	Switch Positions Set to ON
Slot sensor	2, 3, 6
Magnetic	1, 5
Contact closure	2, 4, 6, 7

2-D/A MEB

The 2-D/A MEB provides two 4–20 mA output currents under software control. Up to four 2-D/A MEBs can be installed in each unit. A jumper may be installed at J5 positions 1 and 2 for a 12 V output when powered from a 12 V input power source (used to drive total loop resistance of 300 ohms or less). Alternatively, the 2-D/A MEB may also be assembled with the D/A power board mounted at J5 to provide a 24 V maximum output (used to drive total loop resistance from 250 to 750 ohms).

The +24 V output from the optional 12/24 Vdc converter board can be used as input power to the 2-D/A MEB to provide a 24 V output without the D/A power board. One current loop output signal is connected at TB3-2, with the current loop reference connected to TB3-3. The second current loop output signal is connected at TB3-4, with the reference connected to TB3-3. If the +24 V input power option is used, it is connected at TB1-2 with the input power reference connected to TB1-1 and the J5 jumper installed between positions 1 and 2.

Address Jumpers

A unique address that determines the software configuration must be set using jumpers J6 and J7 for each 2-D/A MEB installed. The address jumpers are configured as shown below.

Table 4–18. Address jumper configuration for 2-D/A MEB

Board #	J6	J7
1	Not installed	Not installed
2	Installed	Not installed
3	Not installed	Installed
4	Installed	Installed

Connection to MEB Terminal Block

Connect TB2 on the 2-D/A MEB to the MEB terminal block (TB2) on the enclosure door panel as shown below.

Table 4–19. 2-DA MEB to TB2 connections

Color	TB2 on 2-DA MEB	TB2 on Enclosure Door
Green	TB2-4 (GND)	TB2-6 (GND)
Blue	TB2-3 (+5V)	TB2-3 (VCC)
Yellow	TB2-2 (SDA)	TB2-4 (SDA)
White	TB2-1 (SCL)	TB2-5 (SCL)

Analog Outputs

The following figure shows typical analog output connections (see 3-0500-065 for a detailed wiring diagram, including connection to the 12/24 Vdc converter).

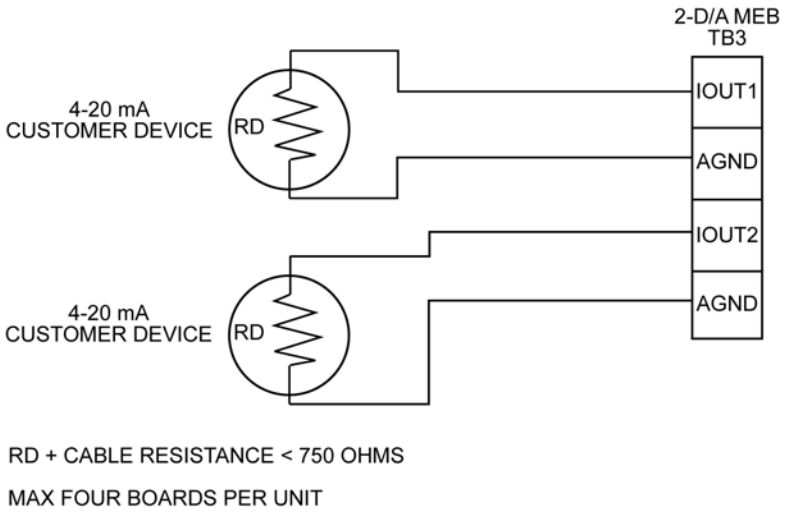


Figure 4–7. Typical output connections to the 2-D/A MEB

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Chapter 5
Other I/O Expansion Options

General

The functionality of the AutoPILOT PRO flow computer can also be increased with the analog input expansion option and the communication expansion option.

Warning Ensure power is off and the area is non-hazardous before making any connections. ▲

Warning Use wires suitable for at least 90°C. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

Note It is assumed that the ground stud at the bottom of the flow computer enclosure has been connected to earth ground. See step 2 in the wiring section of Chapter 3. ▲

The I/O Expansion Backplane

Both I/O expansion options require the I/O expansion backplane.

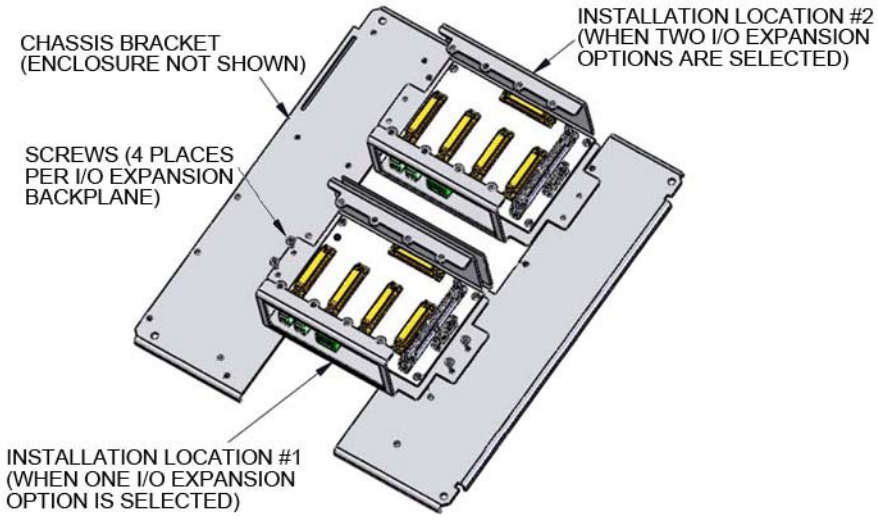

Figure 5–1. I/O expansion backplane

Analog Input Expansion Option

The analog input expansion option consists of the analog input (AI) expansion board and up to four AI terminal boards. Each AI terminal board provides four additional analog inputs, allowing for a maximum of sixteen additional analog inputs. See "Transducer Inputs" in Chapter 2 for information on using the analog inputs with transducers.

Installation

To install the AI expansion option:

1. Ensure power is off and the area is non-hazardous.

2. Refer to Figure 5–2, and plug the AI expansion board into the I/O expansion backplane at J2 and any terminal boards into the backplane at J3, J4, J5, and J6. Tighten the fasteners of each board installed.

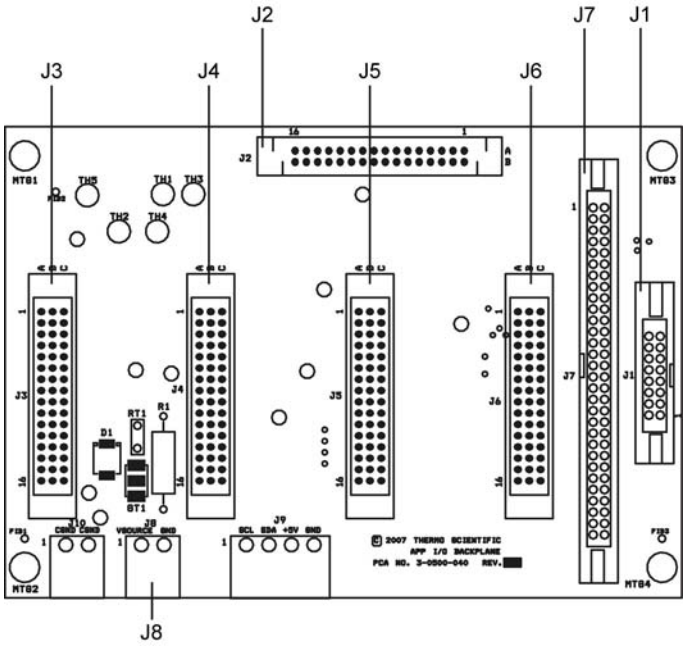

Figure 5–2. Connectors on the I/O expansion backplane

3. Open the enclosure door. Loosen the thumbscrews on the mounting bracket, and lift the main board and mounting bracket up to expose the chassis bracket.

4. Align the backplane assembly with the mounting holes in the chassis bracket, and secure the assembly with the four screws provided in the backplane kit (see Figure 5–1). Reference the general assembly drawing for mounting location and proper orientation.

5. Refer to Figure 5–3 for the following.
   a. Connect a cable from the backplane at J1 to J32 on the back of the main board. (J32 shown in Figure C–2.)
   b. Connect J8-2 (GND) on the backplane to TB1-4 (NEG) on the enclosure door panel.
   c. Connect J8-1 (VSOURCE) on the backplane to TB1-1 (POS) on the enclosure door panel.

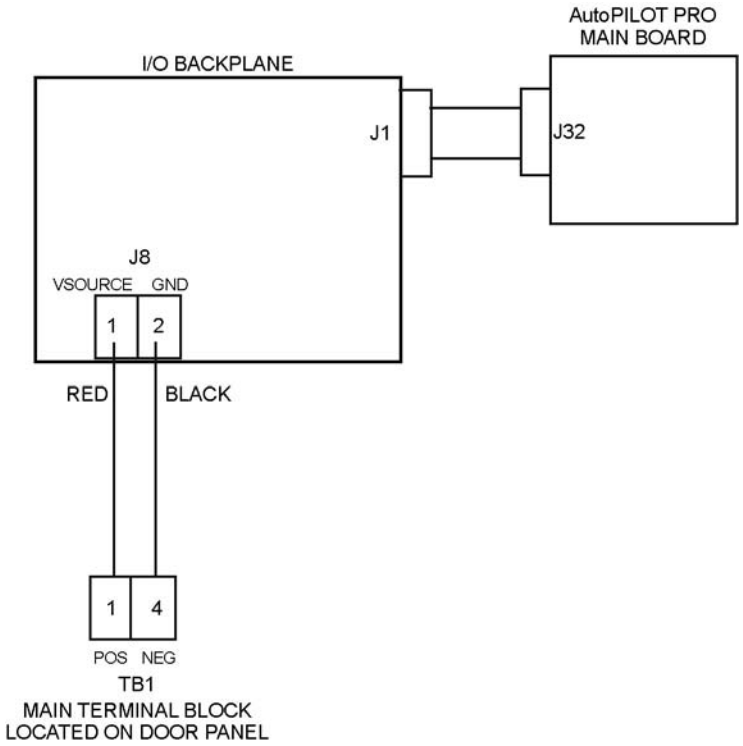

Figure 5–3. Installing the I/O expansion backplane for the AI expansion option

6. Return the main board and mounting bracket to the down position, tighten the thumbscrews, and shut the enclosure door.

Analog Inputs

Each analog input provides transmitter power (XPWR) at a nominal +9 V that power cycles with the unit, a transmitter signal input (IN), and a transmitter power return (AGND). The analog inputs on the AI expansion board are identified in the following table.

Table 5–1. Analog inputs on the AI expansion board

Input	In	AGND	XPWR
AI1	TB1-1	TB1-2	TB1-3
AI2	TB2-1	TB2-2	TB2-3
AI3	TB3-1	TB3-2	TB3-3
AI4	TB4-1	TB4-2	TB4-3

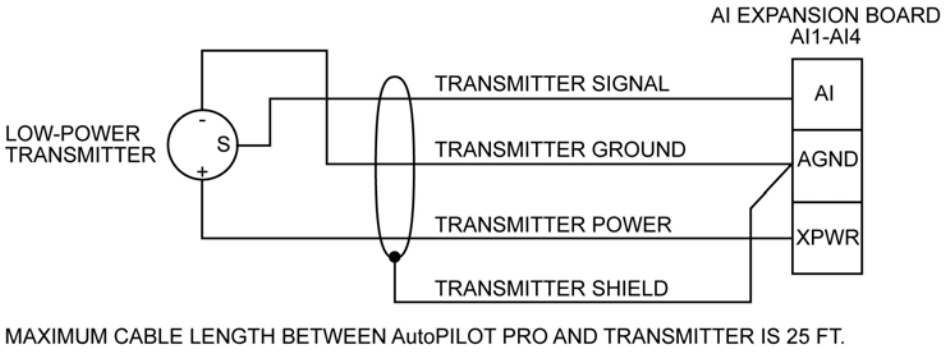

Figure 5–4. Typical wiring for AI terminal board

Communication Expansion Option

The communication expansion option consists of one communication expansion board and up to four communication terminal boards. The communication expansion board adds eight RS232/RS485 ports and two USB ports. Each communication terminal board adds two RS232/RS485 ports.

In RS232 mode, the ports on the communication expansion board support TX, RX, RTS, CTS, DCD, and GND signals and baud rates up to 57600 bps. RTS/CTS flow control is supported.

In RS485 mode, the ports on the communication expansion board can be configured as full or half-duplex using jumpers. Supported RS485 signals are TX+/TX- and RX+/RX- pair. Baud rates up to 57600 bps are supported.

Power to the communication expansion board is controlled by the main board by sensing the DCD activity of each serial port. The board is powered down or turned off if DCD is not present.

The communication terminal board provides connections for two serial ports. Serial port configuration includes mode selection (RS232 or RS485), full or half-duplex (for RS485 mode), and DC or AC termination.

Installation

To install the communication expansion option:

1. Ensure power is off and the area is non-hazardous.

2. Refer to Figure 5–2, and plug the communication terminal boards into the I/O expansion backplane at J3, J4, J5, and J6. Tighten the fasteners of each board installed.

3. Open the enclosure door. Loosen the thumbscrews on the mounting bracket, and lift the main board and mounting bracket up to expose the chassis bracket.

4. Align the backplane assembly with the mounting holes in the chassis bracket, and secure the assembly with the four screws provided in the backplane kit (see Figure 5–1). Reference the general assembly drawing for assembly orientation and mounting location.

5. Refer to Figures 5–5 and 5–6 for the following.

   a. Mount the communication expansion board onto the back of the main board at J29. Note that the mounting bracket will be between the main board and the communication expansion board.

   b. Return the main board and mounting chassis to the down position so that you can see the front of the main board. Insert the two screws through the main board and into the standoffs on the communication expansion board, and tighten them.

   c. Lift the main board and mounting bracket back up and use the ribbon cable to connect J7 on the backplane to J2 on the communication expansion board.

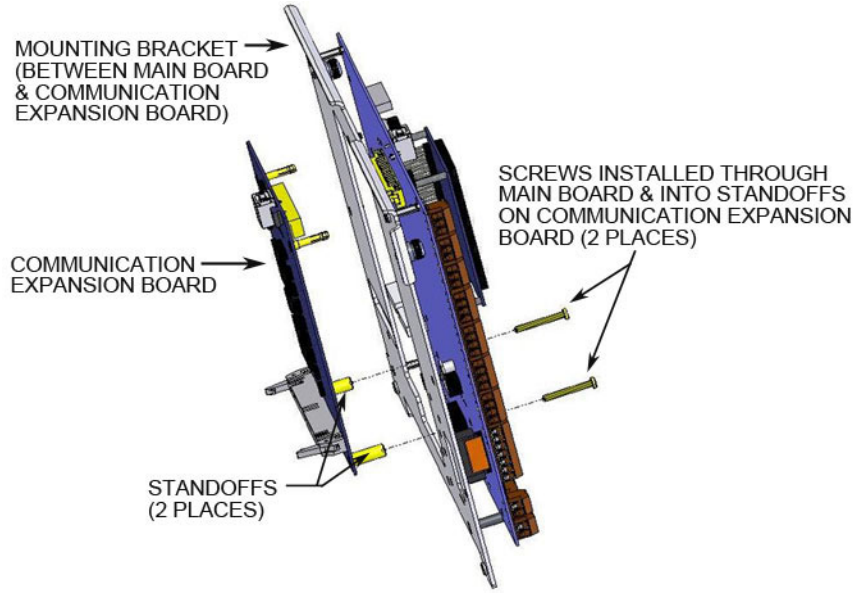

Figure 5–5. Installing the communication expansion board

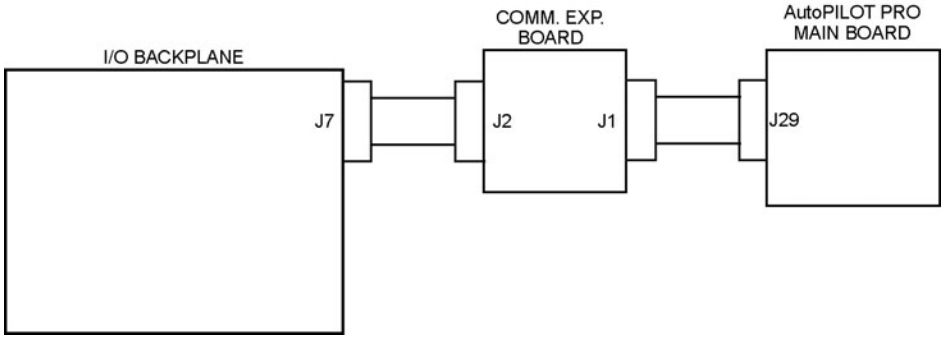

Figure 5–6. Connecting the communication expansion board to the I/O expansion backplane and the main board

Connections & Jumper Settings

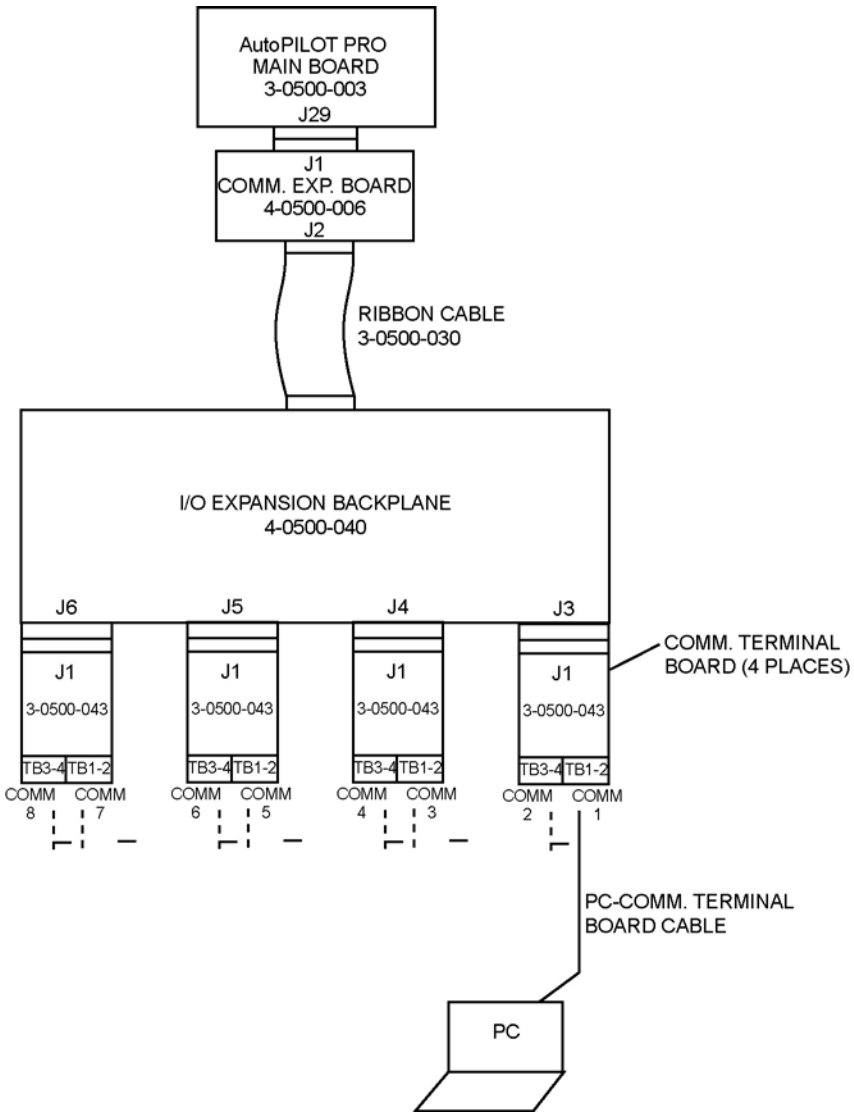

Figure 5–7. System setup for RS232 mode

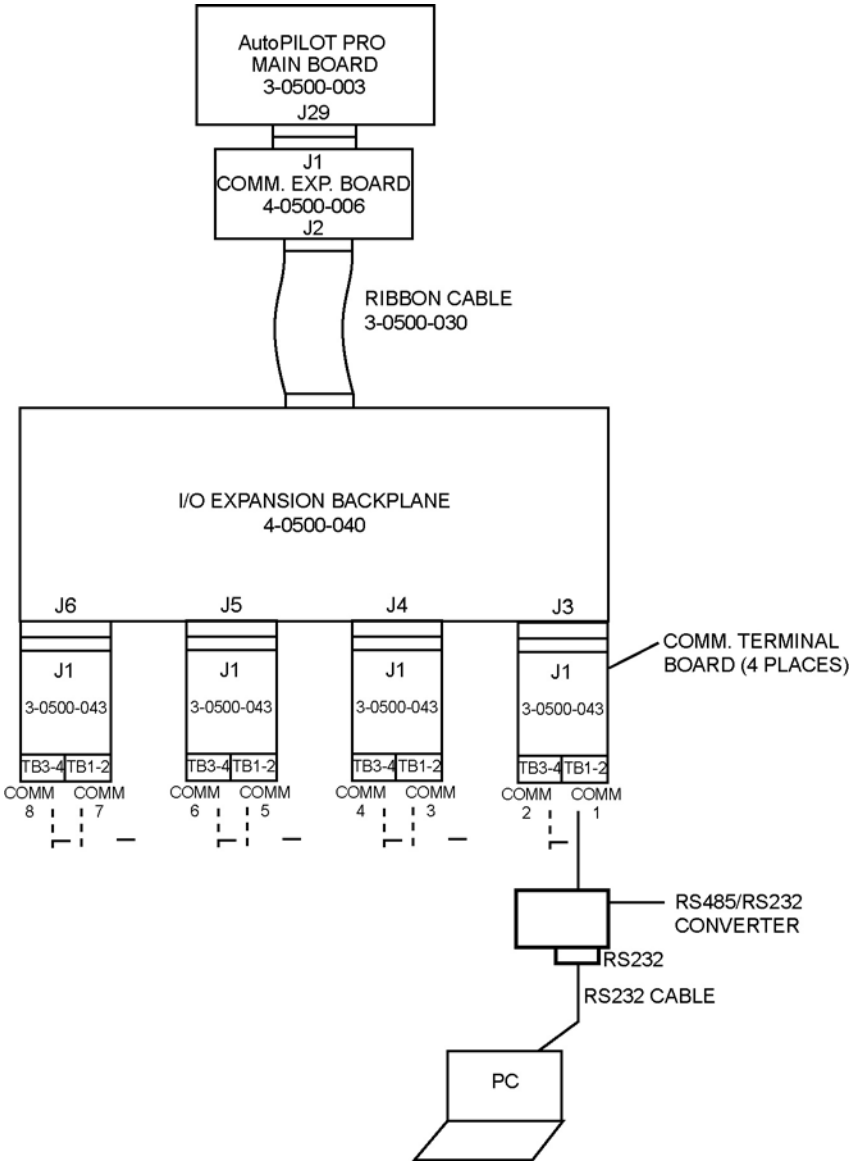

Figure 5–8. System setup for RS485 mode

Table 5–2. Communication port mapping & interconnection

I/O Expansion Backplane	Comm. Terminal Board	Comm. Port #
J3	TB1	1
	TB3	2
J4	TB1	3
	TB3	4
J5	TB1	5
	TB3	6
J6	TB1	7
	TB3	8

Table 5–3. Jumper settings for communication terminal board

Function	Comm. Terminal Jumper	RS232 Mode	RS485 4-Wire Mode	RS485 2-Wire Mode
FORCE DCD CH1	JP14 1-2	Installed	N/A	N/A
DEVICE DCD CH1	JP14 2-3	Installed	N/A	N/A
FORCE DCD CH2	JP13 1-2	Installed	N/A	N/A
DEVICE DCD CH2	JP13 2-3	Installed	N/A	N/A
RS485 SELECT CH1	JP5	Not installed	Installed	Installed
2WIRE SELECT CH1	JP6	Not installed	Not installed	Installed
RS485 SELECT CH2	JP11	Not installed	Installed	Installed
2WIRE SELECT CH2	JP12	Not installed	Not installed	Installed
CH1 DC TERM, TX	JP1	Not installed	Not installed	Not installed
CH1 DC TERM, RX	JP4	Not installed	Not installed	Not installed
CH1 AC TERM, TX	JP2	Not installed	Not installed	Not installed
CH1 AC TERM, RX	JP3	Not installed	Not installed	Not installed
CH2 DC TERM, TX	JP7	Not installed	Not installed	Not installed
CH2 DC TERM, RX	JP10	Not installed	Not installed	Not installed
CH2 AC TERM, TX	JP8	Not installed	Not installed	Not installed
CH2 AC TERM, RX	JP9	Not installed	Not installed	Not installed

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Chapter 6
AutoMITTER SIB Option

General

The Thermo Scientific AutoMITTER safety interface board (SIB) provides a connection for up to four remote mounted AutoMITTER PRO transmitters. Each transmitter provides temperature, differential pressure, and static pressure measurements.

In addition to the material in this chapter, refer to all documentation provided with the SIB and AutoMITTER PRO transmitter.

Warning Ensure power is off and the area is non-hazardous before making any connections. ▲

Warning Use wires suitable for at least 90°C. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

Note It is assumed that the ground stud at the bottom of the flow computer enclosure has been connected to earth ground. See step 2 in the wiring section of Chapter 3. ▲

This chapter is divided into two main sections: the first section applies to CSA certified systems of the SIB and the second applies to the ATEX and Brazilian certified systems.

CSA Certified Systems

The CSA certified version of the SIB has the following ratings:

- Electrical: 12 Vdc nominal at 250 mA maximum
- Class I, Div. 2, Groups C & D; hazardous area
- Temperature Code T4 (135°C)
- Ambient temperature range: -40°C to +85°C

The SIB may accept the following connections:

- Power source from the AutoPILOT PRO flow computer, 12 Vdc nominal at 5 A maximum
- RS232 signal from the AutoPILOT PRO flow computer
- Up to four AutoMITTER PRO transmitters
- One Honeywell smart multivariable transducer for each AutoMITTER PRO transmitter. Transducer option can be from the SMV3000 or SMV2000 series. Maximum pressure rating for selected transducer model is 4500 psi.

The SIB is shown below.

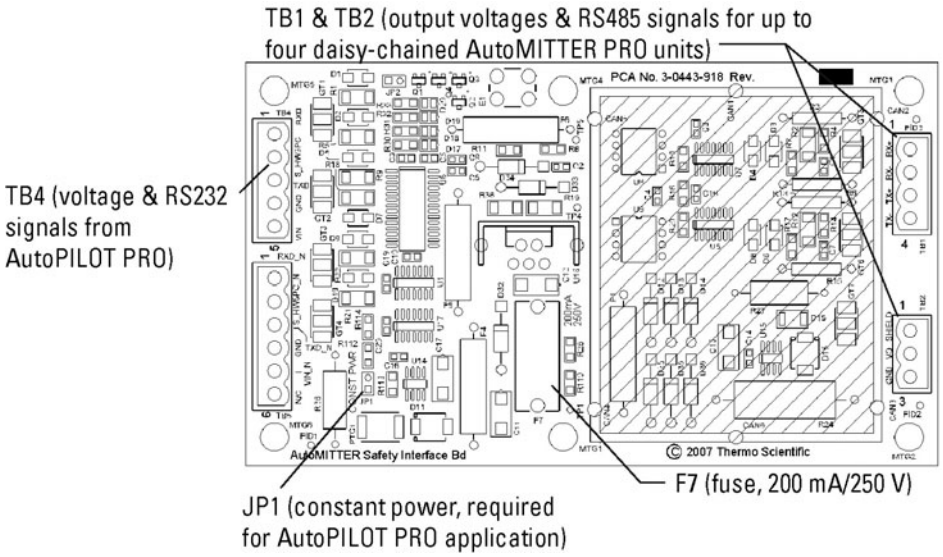
TB1 & TB2 (output voltages & RS485 signals for up to four daisy-chained AutoMITTER PRO units)
TB4 (voltage & RS232 signals from AutoPILOT PRO)
PCA No. 3-0443-918 Rev.
AutoMITTER Safety Interface Bd
© 2007 Thermo Scientific
F7 (fuse, 200 mA/250 V)
JP1 (constant power, required for AutoPILOT PRO application)

Figure 6–1. AutoMITTER SIB, CSA (p/n 3-0443-918)

Installation

Read the following warnings before making any connections.

Warning Do not install the system in any hazardous area, except in those for which the system has been approved. ▲

Warning Do not make any connections unless the area is known to be non-hazardous. Once connections are made, do not disconnect unless power has been removed and the area is known to be non-hazardous. ▲

Warning Do not connect power to TB4 until all other connections are made. ▲

Warning Substitution of components may impair suitability for Class I, Div. 2. ▲

Warning Use wires suitable for at least 90°C. ▲

Warning Service connections can only be used in safe atmospheres. ▲

1. Open the enclosure door. Loosen the thumbscrews on the mounting bracket, and lift the main board and mounting bracket to expose the chassis bracket.

2. Mount the SIB onto the flow computer chassis bracket using the standoffs provided. See the figure below for assembly orientation and mounting location.

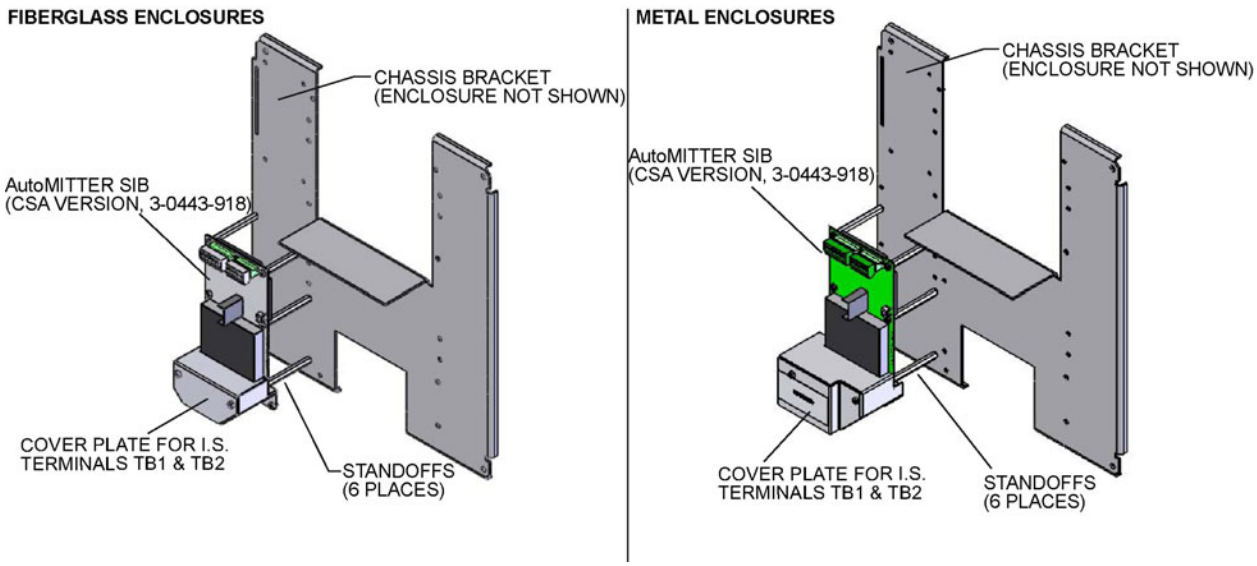

Figure 6–2. Mounting the SIB onto the chassis

3. TB14 on the main board is the SIB connector. Using the SIB cable, connect TB14 to TB4 on the SIB as shown in Figure 6–3.

Warning Do not connect power to TB4 until all other connections have been made. ▲

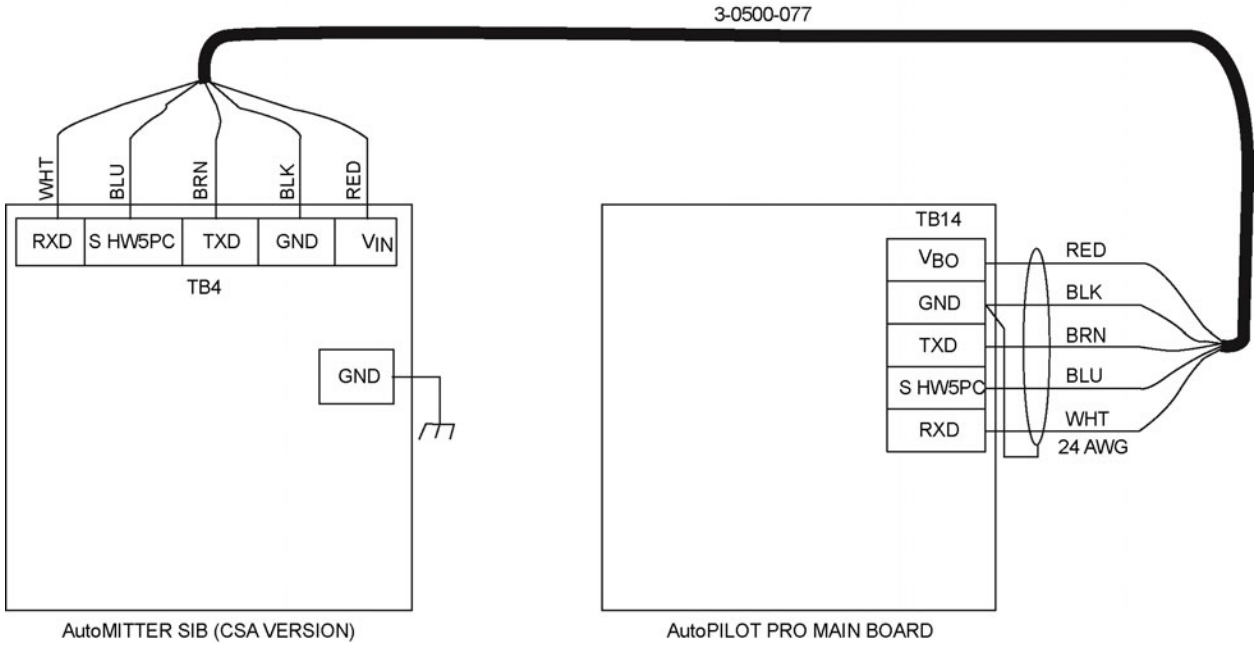

Figure 6–3. SIB to main board wiring, CSA

4. TB1 and TB2 on the SIB are used for connection to the AutoMITTER PRO transmitter. Remove the cover plate to access these I.S. terminals. Refer to 0-0497-517 for a detailed AutoMITTER PRO transmitter wiring diagram.

Warning The cover plate must be replaced after connections are made. ▲

5. J38 on the main board is for SIB / Comm3 selection. Install a jumper to select SIB.

6. Return the main board and mounting bracket to the down position, tighten the thumbscrews, and shut the enclosure door.

ATEX or Brazilian Certified Systems

Hazardous Area Installations

The following instructions are specific to the AutoMITTER SIB installed in hazardous areas. For European installations, reference European ATEX Directive 94/9/EC, Annex II, 1.0.6. For Brazilian installations, reference Inmetro Administrative Rule no. 179 (May 18, 2010)).

Note The material in this appendix applies to European and Brazilian hazardous area installations. ▲

1. The equipment is Zone 0 with intrinsically safe outputs to the AutoMITTER PRO transmitter and may be only used with flammable gases and vapors with apparatus Group IIB and with temperature class T4.

2. The equipment is only certified for use in ambient temperatures in the range -40°C to +80°C. It should not be used outside this range.

3. The certificate marking is detailed in Figure 6–4 for Europe and Figure 6–5 for Brazil.

4. Repair of this equipment shall be carried out by the manufacturer or in accordance with the applicable code of practice.

5. The certification of this equipment relies on the following materials used in its construction:

   Stainless steel.

   If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.

   Aggressive substances: e.g. solvents that may affect polymeric materials

   Suitable precautions: e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

6. Earth bonding: The enclosure must be earth bonded back to the source of the power supply using a 4 mm^2 cross-sectional area conductor using the earth lug provided on the enclosure.

Thermo Fisher Scientific
Sugar Land, Texas 77478
AutoMITTER Safety Interface
SERIAL NO:
VOLTS: 12 VDC Nominal
AMPS: 250 mA MAX.
I.S. PARAMETERS FOR EACH SEPERATE CHANNEL FROM TB3 AND TB4: Po = 0.92W Uo = 7.14V Co = 240µF
Ci = 0 Io = 2.404A - Transient Lo = 24.6µH
Li = 0 Io = 136mA - Continous Lo/Ro = 33µH/Ohm
INPUT PARAMETERS AT TB1 AND TB2: Ui = 7.14V
REFERENCE GENERAL ASSY DRAWING: 0-0443-1036
COMPLIANCES:
EPSILON 07 ATEX 2309
II 3(1) G Ex nA[ia] IIB T4
(Tamb -40C TO +80C)
WARNING:
ENCL TYPE IP65
ENCLOSURE SHALL NOT BE OPENED UNLESS THE AREA IS KNOWN TO BE FREE OF FLAMMABLE MATERIALS OR UNLESS ALL DEVICES WITHIN ENCLOSURE HAVE BEEN DE-ENERGIZED.
4-0443-1038-01

Figure 6–4. Certificate marking for European installations

Thermo Fisher Scientific
Sugar Land, Texas 77478
AutoMITTER Safety Interface
SERIAL NO:
VOLTS: 12 Vcc Nominal
AMPS: 250 mA MAX.
Um = 250V
Parâmetros da saída intrinsecamente seguros - 4 canais separados
Po = 0.92W Uo = 7.14V Co = 240µF de TB3 e TB4.
Ci = 0 Io = 2.404A - Transient Lo = 24.6µH
Li = 0 Io = 136mA - Continous Lo/Ro = 33µH/Ohm
Parâmetros de entrada intrinsecamente seguros 4 canais separados
de TB1 e TB2: Ui = 7.14V
REFERENCIA GERAL PARA MONTAGEM DA FIAÇÃO : 0-0443-1036
CONFORMIDADE:
TÜV 11.0163
Ex nA [ia Ga] IIB T4 IP65 Gc
-40°C ≤ Ta ≤ +80°C
ATENÇÃO:
O INVÓLUCRO NÃO DEVE SER ABERTO A MENOS QUE A ÁREA ESTEJA LIVRE DE MATERIAIS INFLAMÁVEIS OU QUE TODOS OS DISPOSITIVOS DENTRO DO INVÓLUCRO TENHAM SIDO DESENERGIZADOS.
4-0443-1038-02

Figure 6–5. Certificate marking for Brazilian installations

Wiring Overview

The ATEX and Brazilian certified version of the SIB the following ratings:

- Electrical: 12 Vdc nominal at 250 mA maximum
- Enclosure type: IP65
- Zone 0, Group IIB
- Temperature Code T4 (135°C)
- Ambient temperature range: -40°C to +80°C

The SIB may accept the following connections:

- Power source from flow computer, 12 Vdc nominal.
- RS232 signal from flow computer.
- Up to four AutoMITTER PRO transmitters.
- One Honeywell smart multivariable transducer for each AutoMITTER PRO transmitter. Transducer option can be from the SMV3000 or SMV2000 series. Maximum pressure rating for selected transducer model is 4500 psi.

Cable entries into the enclosure may be sealed with an IP65 rated conduit seal certified by an ATEX/Brazilian notified body used in accordance with the manufacturer's instructions.

The SIB is shown below.

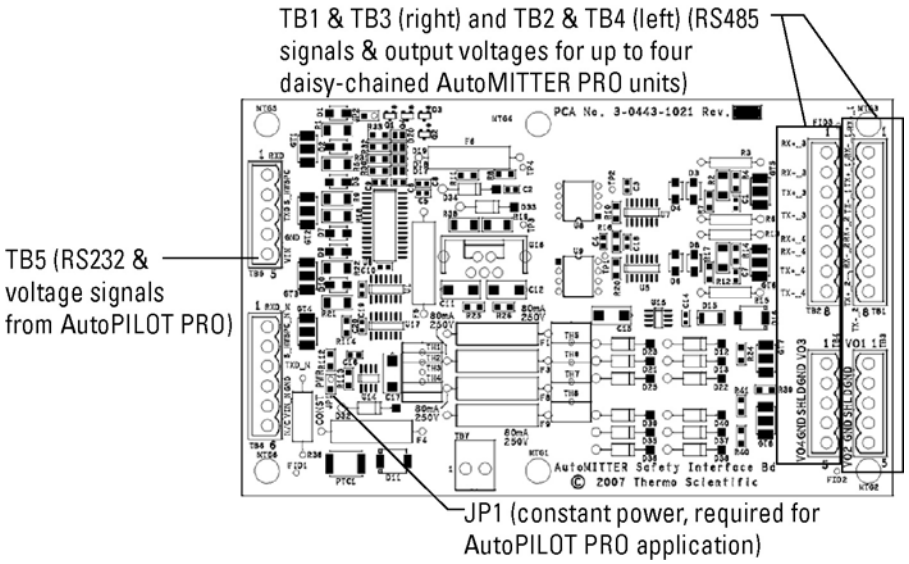
TB1 & TB3 (right) and TB2 & TB4 (left) (RS485 signals & output voltages for up to four daisy-chained AutoMITTER PRO units)
TB5 (RS232 & voltage signals from AutoPILOT PRO)
JP1 (constant power, required for AutoPILOT PRO application)

Figure 6–6. AutoMITTER SIB, ATEX/Brazilian installations (p/n 3-0443-1021)

Installation

Read the following warnings before making any connections.

Warning Do not install the system in any hazardous area, except in those for which the system has been approved. ▲

Warning Do not make any connections unless power has been removed and the area is known to be non-hazardous. Once connections are made, do not disconnect unless power has been removed and the area is known to be non-hazardous. ▲

Warning Substitution of components may impair the intrinsic safety of the product. ▲

1. Open the enclosure door. Loosen the thumbscrews on the mounting bracket, and lift the main board and mounting bracket up to expose the chassis bracket.

2. Refer to Figure 6–6 for the following.

   a. Mount the SIB onto the standoffs on the SIB mounting bracket.

   b. Mount the SIB assembly onto flow computer chassis bracket. Tighten the fasteners to secure the SIB assembly.

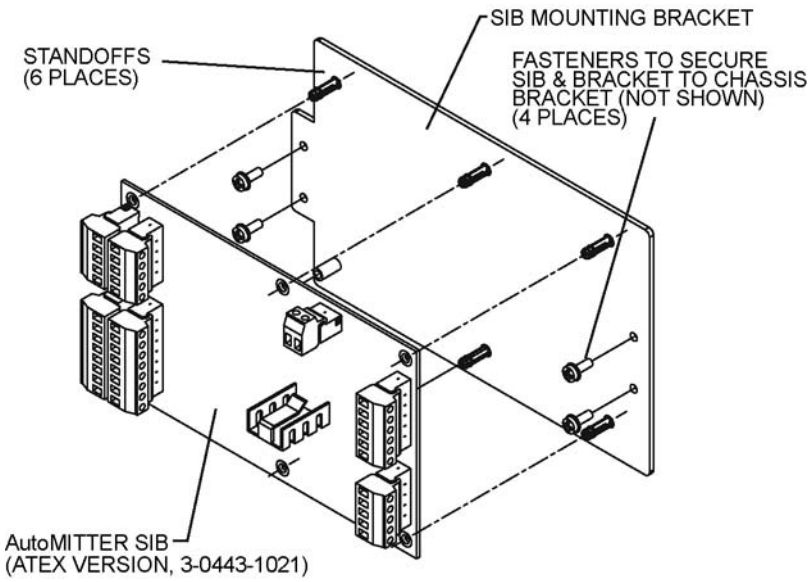

Figure 6–7. Installing the SIB onto the bracket

3. TB14 on the main board is the SIB connector. Using the SIB cable, connect TB14 to TB5 on the SIB as shown in Figure 6–7.

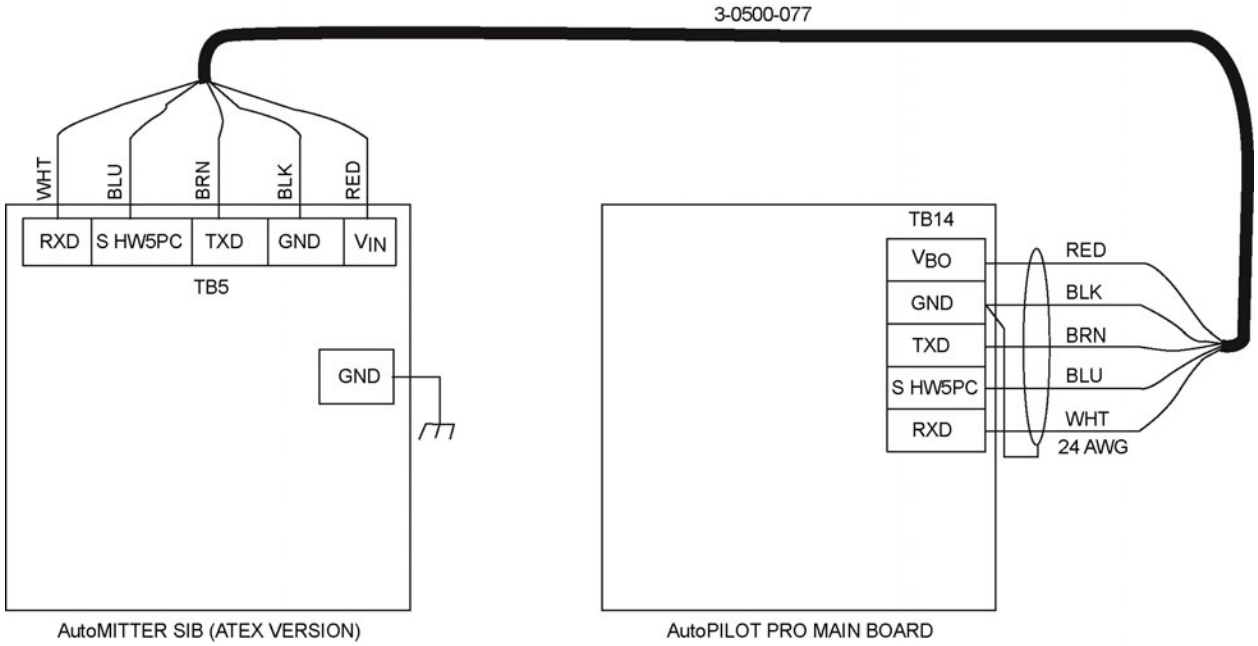

Figure 6–8. SIB to main board wiring, ATEX/Brazilian installations

4. TB1 and TB3 on the SIB are used for connection to the AutoMITTER PRO transmitter. Refer to 0-0497-516 for the SIB to AutoMITTER PRO transmitter wiring diagram. Note the I.S. parameters for each separate channel from TB3:

Uo = 7.14 V	Io = 2.404 A transient
Po = 0.92 W	Io = 136 mA continuous
Ci = 0	Li = 0
Co = 240 µF	Lo = 24.6 µH
Lo/Ro = 33 µH/ohm	

5. J38 on the main board is for SIB / Comm3 selection. Install a jumper to select SIB.

6. Return the main board and mounting bracket to the down position, tighten the thumbscrews, and shut the enclosure door.

Chapter 7
Radio Options

Warning Ensure power is off and the area is non-hazardous before making any connections. ▲

Warning Use wires suitable for at least 90°C. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

Note It is assumed that the ground stud at the bottom of the flow computer enclosure has been connected to earth ground. See step 2 in the wiring section of Chapter 3. ▲

Tip Go to Appendix A for radio part numbers and kit information. ▲

MDS Radio Option

An optional MDS 9810 series radio manufactured by GE MDS and labeled with the UL Mark can be installed in the flow computer enclosure for United States installations. For Canadian installations, an optional MDS 9810 series radio manufactured by GE MDS and labeled with the CSA Mark can be installed in the flow computer enclosure. The radio is mounted to the equipment panel using a standard bracket supplied by the manufacturer with standoffs. The host communication port (TB16) on the main board is not available for customer use when connected to the MDS radio option.

Warning Before installing the MDS 9810 series radio in the flow computer, ensure the radio has the UL recognized component label for United States installations. For Canadian installations, ensure the MDS 9810 series radio has the CSA label. If the flow computer is in a hazardous location, do not install the radio if it does not have the appropriate UL or CSA recognized label. ▲

The power switches to the radio with solid state FETs under software control. Licensed radios that support long distance communication require more power current. If the maximum current is greater than 1 A, the radio must use an external power supply.

The control of the radio power output is a 5 V logic level signal on the flow computer's main board. For testing, this control signal is defined as discrete output channel 3.

Installation

The MDS radio assembly consists of the radio (customer provided) and a support bracket. To install the MDS radio assembly into the flow computer enclosure, follow the steps below.

Warning Ensure the area is non-hazardous before connecting or disconnecting the radio. ▲

1. Open the enclosure door. Loosen the thumbscrews on the mounting bracket, and lift the main board and mounting bracket up to expose the chassis bracket.

2. Mount the MDS radio onto the support bracket, and then secure the assembly to the chassis bracket with the fasteners on the radio bracket. Refer to 0-0500-114 for assembly orientation and mounting location.

3. Connect the coaxial ground to the enclosure ground stud using the coaxial ground hardware provided.

4. Mount an N-type bulkhead jack or optional coaxial protector on the bottom of the enclosure, and connect it to the radio antenna output through a coaxial cable and N-type plug.

5. Connect the cable assembly (p/n 3-0500-090) from the radio's DB25P connector to the flow computer's host port (TB16 on the main board) or other RS232 device. Connections to TB16 are shown in the table below.

Table 7–1. MDS radio cable assembly to TB16 connections

Cable Assembly Color	TB16 on Main Board
Black	TB16-8 (GND)
Green	TB16-5 (DCD)
Brown	TB16-4 (RTS)
Red	TB16-3 (TX)
Blue	TB16-2 (CTS)
White	TB16-1 (RX)

6. Return the main board and mounting bracket to the down position. Connect the radio's power cable from RADIO IN to TB12 on the main board as shown in the table below.

Table 7–2. MDS radio power cable to TB12 connections

Color	MDS Radio	TB12 on Main Board
Red	PWR	TB12-1 (VRadio1)
Black	GND	TB12-2 (GND)

7. Tighten the thumbscrews on the mounting bracket, and shut the enclosure door.

Connections are shown in the figure below. For a detailed wiring diagram, see 3-0500-081.

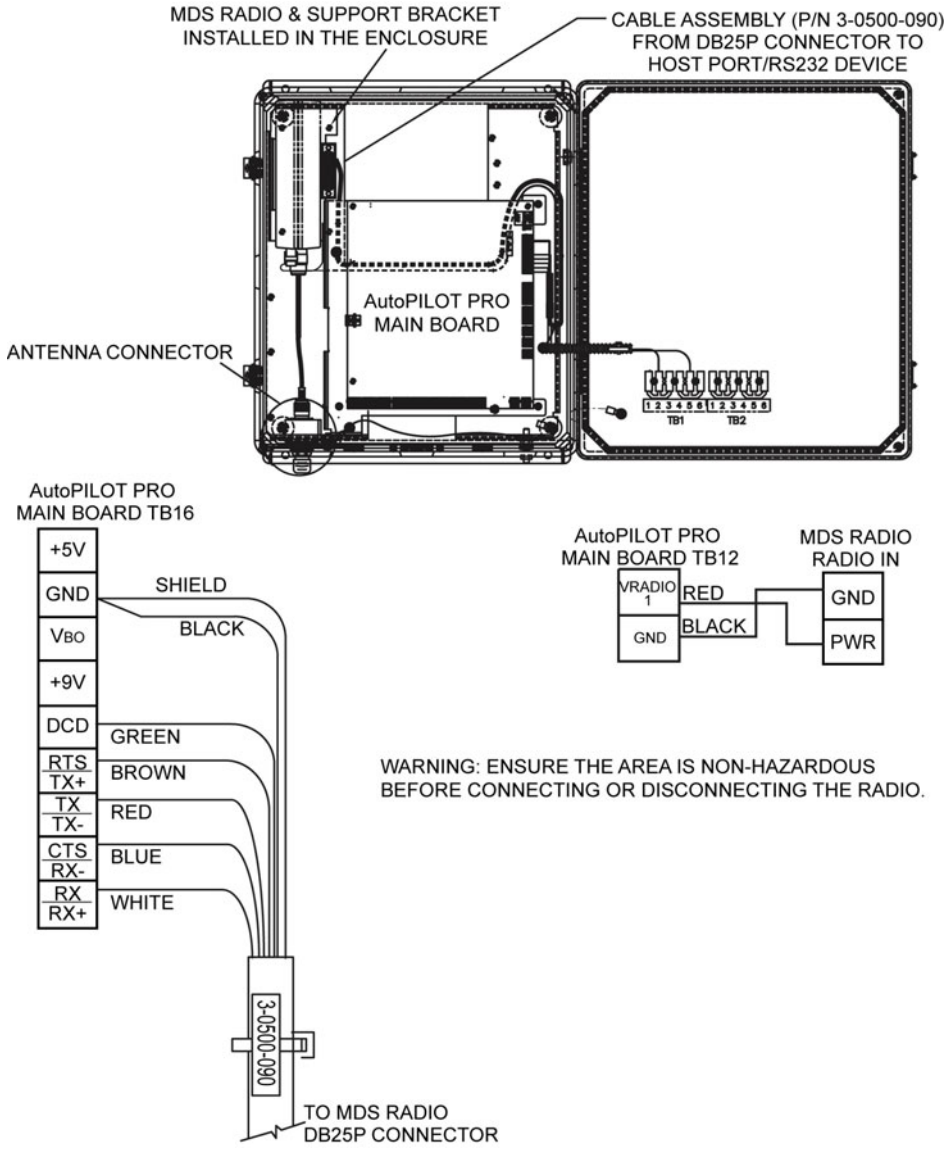

Figure 7–1. Connections for MDS radio option

AutoWAVE Radio Option

An optional Thermo Scientific AutoWAVE radio model DGRO9RFS labeled with the UL/CUL Mark can be installed in the flow computer enclosure for United States or Canadian installations. The host communication port (TB16 on the main board) is not available for use when connected to the AutoWAVE radio option.

The power switches to the radio with solid state FETs under software control. Licensed radios that support long distance communication require more power current. If the maximum current is greater than 1 A, the radio must use an external power supply.

The control of the radio power output is a 5 V logic level signal on the flow computer's main board. For testing, this control signal is defined as discrete output channel 3.

The option is available with the radio or without the radio (radio ready kit).

Installation

To install the AutoWAVE radio assembly into the flow computer enclosure, follow the steps below.

Warning Ensure the area is non-hazardous before connecting or disconnecting the radio. ▲

1. Open the enclosure door. Loosen the thumbscrews on the mounting bracket, and lift the main board and mounting bracket up.

2. Place one lock washer over the appropriate mounting holes in the chassis bracket, and then insert a standoff. Mount the radio assembly onto the standoffs and secure it with the screws supplied. Refer to the general assembly drawing for assembly orientation and mounting location.

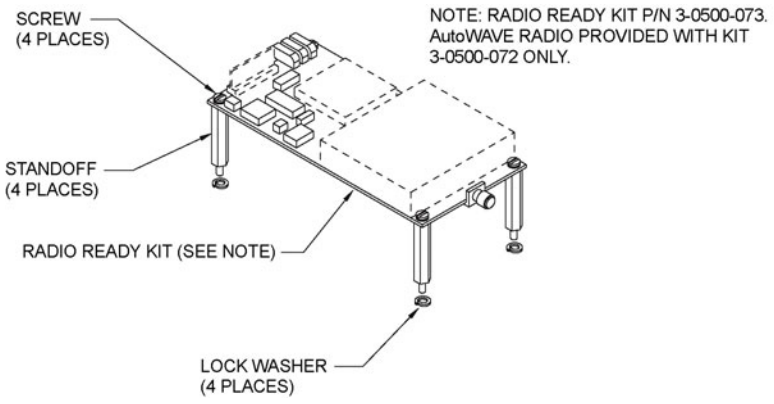

Figure 7–2. AutoWAVE radio mounting (chassis bracket not shown)

3. Connect the coaxial ground to the enclosure ground stud using the coaxial ground hardware provided.

4. Mount an N-type panel mount jack or optional coaxial protector on the bottom of the enclosure, and connect it to the radio antenna output through a coaxial cable and an SMA plug.

5. Connect the cable assembly (p/n 3-0500-075) from the radio's 10-pin connector to the computer's host port (TB16 on the main board) or other RS232 device. If connecting to TB16, return the main board and mounting bracket to the down position. Connections to TB16 are shown in the table below.

   Table 7–3. AutoWAVE radio cable assembly to TB16 connections

Color	Radio 10-Pin Connector	TB16 on Main Board
White	5	TB16-1 (RX)
Black/Shield	6	TB16-8 (GND)
Green	7	TB16-3 (TX)
Blue	10	TB16-5 (DCD)
Orange	Jumper	TB16-2 (CTS)
Orange	Jumper	TB16-4 (RTS)

6. For power, connect the cable from the radio to TB12 on the main board as shown in the table below.

   Table 7–4. AutoWAVE radio power to TB12 connections

Color	AutoWAVE Radio	TB12 on Main Board
Red	+BAT	TB12-1 (VRadio1)
Black	GND	TB12-2 (GND)

7. If necessary, return the main board and mounting bracket to the down position. Tighten the thumbscrews, and shut the enclosure door.

Connections are shown in the figure below. For a detailed wiring diagram, see 3-0500-072 (radio kit) or 3-0500-073 (radio ready kit).

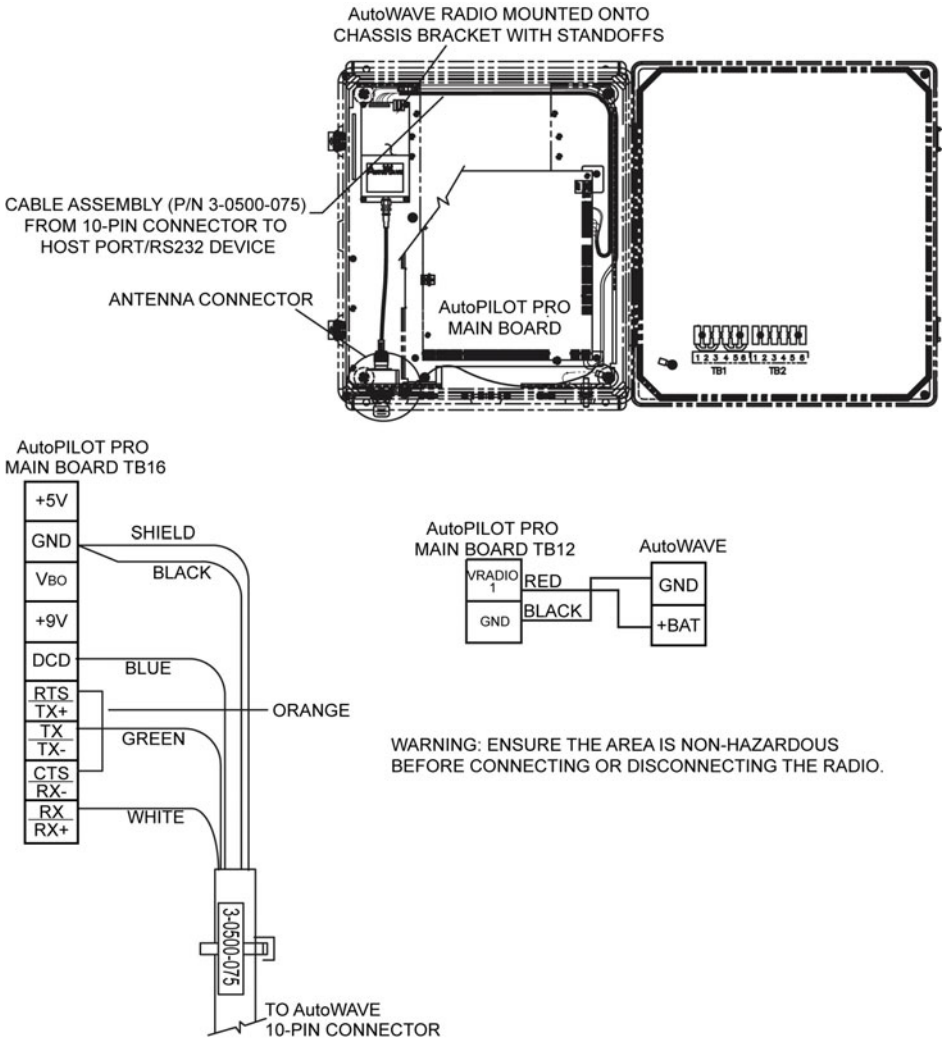

Figure 7–3. Connections for AutoWAVE radio option

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Chapter 8
212A Modem Option

General

If the host communication port (TB16 on the main board) is not being used internally, it may be used to interface with the Thermo Scientific 212A modem. The modem provides communication between the AutoPILOT PRO flow computer and customer equipment through a two-wire telephone interface.

Warning Ensure power is off and the area is non-hazardous before making any connections. ▲

Warning Use wires suitable for at least 90°C. ▲

Warning Installation must be carried out in accordance with local site requirements and regulations. ▲

Note It is assumed that the ground stud at the bottom of the flow computer enclosure has been connected to earth ground. See step 2 in the wiring section of Chapter 3. ▲

Note The internal battery option cannot be used with the 212A modem option. ▲

Tip Go to Appendix A for modem part number and kit information. ▲

Installation

To install the 212A modem assembly into the flow computer enclosure, follow the steps below.

Warning Ensure the area is non-hazardous before connecting or disconnecting the modem. ▲

1. Open the enclosure door. Loosen the thumbscrews on the mounting bracket, and lift the main board and mounting bracket up.

2. Refer to Figure 8–1 for the following. Refer to the general assembly drawing for assembly orientation and mounting location.
   a. Place one star lock washer over each mounting hole on the support bracket, and then insert a 3/8-inch standoff.
   b. Align the modem onto the bracket, and secure it using the star lock washers and 1/2-inch standoffs.
   c. Mount the assembly onto the chassis bracket using the screws provided.

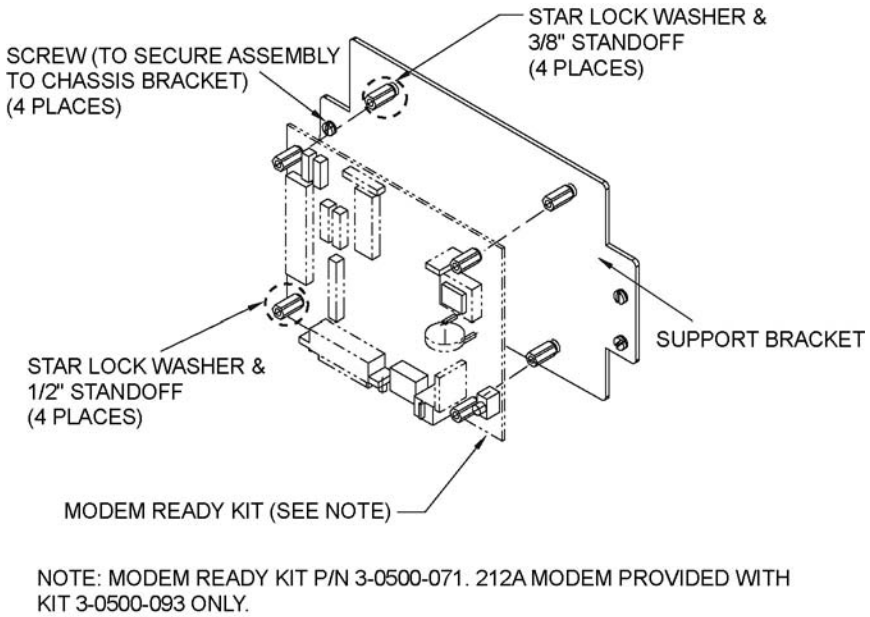

Figure 8–1. 212A modem mounting (chassis bracket not shown)

3. Connect the modem ground (E1) to the ground stud at the bottom of the flow computer enclosure.

4. Connect the cable assembly (p/n 3-0500-122) from the modem's J4 connector to the computer's host port (TB16 on the main board) or other RS232 device. If connecting to TB16, return the main board and mounting bracket to the down position. Connections to TB16 are shown in the table below.

   Table 8–5. 212A modem cable assembly to TB16 connections

Cable Assembly Color	TB16 on Main Board
Green/Shield	TB16-8 (GND)
White	TB16-1 (RX)
Blue	TB16-2 (CTS)
Violet	TB16-3 (TX)
Brown	TB16-4 (RTS)
Yellow	TB16-5 (DCD)
Black	TB16-6 (+9V)
Orange	TB16-7 (V_{BO})
Red	TB16-9 (+5V)

5. J5 is the modem's power connector. Using the 20 AWG wire provided, connect J5 to TB1 on the enclosure door panel as shown below.

   Table 8–6. 212A modem power to TB1 connections

Color	J5 on 212A Modem	TB1 on Enclosure Door
Red	PWR	TB1 positions 1–3 (POS)
Black	GND	TB1 positions 4–6 (NEG)

6. Connect a standard miniature six-position RJ11C telephone plug (customer supplied) to the phone line connector on the modem (J6).

7. If necessary, return the main board and mounting bracket to the down position, tighten the thumbscrews, and shut the enclosure door.

Connections are shown in the figure below. For a detailed wiring diagram, see 3-0500-071 (modem ready kit) or 3-0500-093 (modem kit) in the drawing appendix.

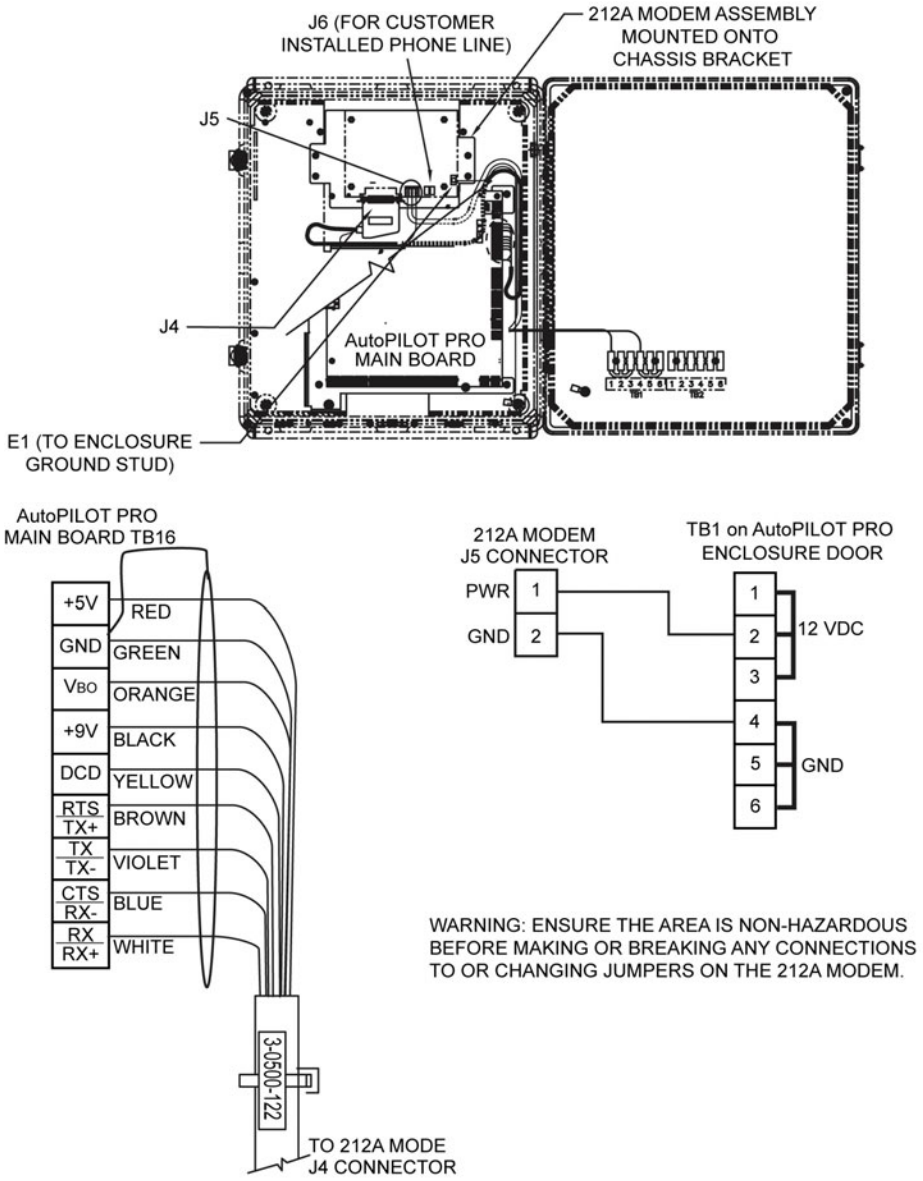

Figure 8–2. Connections for 212A modem option

Chapter 9
Front Panel Interface

You can interface with the instrument through the keypad and LCD on the front panel or through the AutoCONFIG software. This chapter covers the front panel interface. Instructions on using the AutoCONFIG software are covered in the software help system, which is accessible through the AutoCONFIG software by clicking the Knowledge Base icon.

Using the Keypad

The AutoPILOT PRO flow computer features a 4 x 4 keypad. The table below describes how to use the keys to operate the instrument.

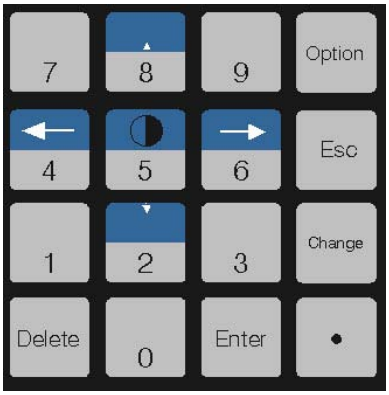

Figure 9–1.

Table 9–1.

Key	Description
Number keys (0–9)	Use to enter values. Press **5** to view contrast setting. Use up and down arrows to adjust the contrast.
Delete	Press to clear the displayed value.
Enter	Press to go to the next menu or to exit the display list and receive the user ID / password prompt.
Period	Press to enter a decimal. In some cases, you can press the period to toggle the displayed item on and off. May also be pressed to pause a scrolling display.

Key	Description
Up arrow	Press to scroll up through a list of menu items or options. After pressing **5** from the main screen, press the up arrow to increase the screen contrast.
Down arrow	Press to scroll down through a list of menu items or options. After pressing **5** from the main screen, press the down arrow to decrease the screen contrast.
Change	For items with multiple options, press to move to the next option. When entering negative values, press **Change** to toggle the minus sign on. Pressing **Change** again toggles the minus sign off.
Right and left arrows	Move the cursor to the right or left.
Esc	Press to step back to the previous screen.
Option	

Contrast Adjustment

If the display appears blank, you may need to adjust the contrast. Press 5 to enter the Contrast Adjustment screen. Press the **up arrow** to make the screen lighter and the down arrow to make it darker. Press **B** to exit the screen.

Getting Started

When you first apply power to the unit (or after a cold start), the AutoEXEC displays three screens. The first two are the bootloader. The third screen displays "No Display List."

You will be prompted to enter your user ID and password.

The menus accessible through the keypad depends on if the unit has been configured keypad menu lists and on the user's level of security access. The base menus are listed below. Refer to the AutoCONFIG software help for specific details on the menus, information on the types of keypad menu lists, and instructions on how to add menus to or remove menus from the keypad lists.

Table 9–2.

Table #	Menu Heading
1	FP Entry – Floating Point Value
2	Disc Entry – Discrete Value
3	Byte Entry – Byte Value
4	16Bit Entry – 16-Bit Word Table
16	AnalogIn – Physical Analog Input Table
17	Smart Input – Physical Smart Transducer Input Table
18	Honeywell DE – Physical Honeywell DE Input Table
19	Disc Input – Physical Discrete Input Table
20	Acc Input – Physical Accumulator Input Table
21	AnalogOut – Physical Analog Output Table
22	DiscOut – Physical Discrete Output Table
30	System Status
31	System Control
33	PID Entry – PID Calculation Entry
34	Proportional – Proportional Output Calculation
35	HILO Calc – Hi/Low Selection
36	AlmStatCalc – Alarm Status Calculation
37	PtConvCalc – Point Type Conversion Calculation
38	DP FlowCalc – DP Flow Calculation
39	AGA7 FlowCalc – AGA 7 Flow Calculation
40	AGA10 SoSCalc – AGA 10 Speed of Sound Calculation
41	MeterStnCalc – Meter Station Calculation
42	RunSwitchCalc – Meter Run Switching Calculation
43	HistAvgCalc – Historical Average Calculation
44	FPScaleCalc – Floating Point Scaling Calculation
45	16BitScaleCalc – Word Scaling Calculation
46	LogicalOR – Discrete Logical OR
47	LogicalAND – Discrete Logical AND
48	FPSumCalc – Floating Point Summary
50	FPCopy – Floating Point Copy
96	CommPortDef – Communications Port Definition
97	ModbusSlave – Modbus Slave Communication Block

Table #	Menu Heading
98	ModbusMstr – Modbus Master Communication Block
100	Chromatograph
101	TankGauge
128	GasQuality – Gas Components
192	LogAllocTable – Historical Data Log
193	AA_AllocTable – Audit/Alarm Data Log

Chapter 10
Functional Description

Flow Computer Tasks

This chapter provides a functional description of the instrument. For additional details, such as instructions on configuring calculations or performing calibrations, refer to the AutoCONFIG software help system.

Meter Types

The AutoPILOT PRO flow computer provides support for differential pressure meter and linear meter types. For differential pressure meters, the instrument supports orifice, V-Cone, annubar, and slotted DP installations. For linear meters, the instrument supports turbine and ultrasonic installations.

Equations

The following equations are used in combinations specified by the AGA.

Supercompressibility

Supercompressibility is run once per second for all meter runs. Users may select from the following regardless of the meter type:

- AGA 8 Gross Method – 1992
- AGA 8 Detail Method – 1992
- AGA 8 Short Form – 1985
- NX-19
- NX-19 Analysis
- GERG

Differential Meters

The differential meter calculations are run once per second for all meter runs. Users may select from the following for differential type meters:

- AGA 3 / ASTM 2530-1992
- AGA 3-1985
- GOST
- V-Cone
- Annubar
- Slotted-DP

Linear Meters

Linear meter calculations are run once per second for all meter runs. Per AGA 7 and AGA 9, the equation is fixed at AGA 7 for both turbine and ultrasonic meter installations.

Energy

The AGA 5 energy calculation is run once per second for all meter runs.

Diagnostic

For diagnostic and alarming purposes specifically in ultrasonic applications, the AGA 10 – Speed of Sound equation is run once per second. The calculated value is compared to the measured value as retrieved from the ultrasonic device via a communications port. If the calculated value deviates from the measured value by a user configurable amount, an alarm is generated.

Factors

Fwv

The water vapor factor is a direct multiplier into the flow equation that compensates for any water vapor in the system. The number is a value close to the one derived from the following equation:

```
Fwv 1 – [((lb. / mmcf) 21.0181) / 1000000 ].
```

Manual: Enter the Fwv directly (usually approximately .98).

Partial Calculation: Enter the pounds of water per million cubic feet of gas to enable the flow computer to calculate Fwv.

Full Calculation: This method assumes a fully saturated gas and uses the current pressure and temperature of the gas to calculate what the water content should be. The results of this calculation are then used as the input into the Fwv equation to obtain the Fwv factor.

Caution The water content equation used for the full calculation method is not an AGA sanctioned equation. Care should be taken in custody transfer applications. For custody transfer applications, the manual or partial calculation methods should be used using lab results or AGA test methods for determining water vapor content. ▲

Fws

A full well stream factor is provided for production applications that require compensation for well stream conditions. This value defaults to 1.0 and is a direct multiplier into the flow rate equation.

Turbine Meter Linearization

A 10-point break-pair table of K-Factor versus Frequency is utilized for the linearization of turbine meter K Factors. Individual tables are used for each meter run configured as a linear meter. Interpolation of the K-Factor between table points may be enabled and disabled on an individual meter run basis.

Averaging Techniques

Users may configure the AutoPILOT PRO flow computer to support one of the four averaging techniques as outlined in the API Ch 21.1.

1. Flow dependent time-weighted linear averaging
2. Flow dependent time-weighted formulaic averaging
3. Flow weighted linear averaging
4. Flow weighted formulaic averaging

For differential type meters, the square root of the measured differential pressure is used as the weight value in averaging techniques 3 and 4. For linear type meters, the Actual Flow Delta Volume is used as the weight value.

Calibration/As Found/As Left

A calibration routine is used for all analog inputs. The unit is capable of 2- or 3-point calibrations as well as a single point for re-zero. All calibration changes are logged in the audit trail with the old and new values for each of the calibration points.

The unit also allows for the verification of all analog inputs through an As Found / As Left procedure as outlined in the API Ch 21.1. Separate audit codes are used for As Found versus As Left audits.

Historical Data

The unit keeps historical logs for all meter run data as well as audit/alarm (event) logs for each meter run configured. For each meter run, the system defaults include:

- Hourly logs: storage for 840 hourly records (35 days)
- Daily logs: storage for 65 records
- Events: storage for the last 500 events

The data stored in these logs is configurable. Table #226 is reserved for DP flow calculations, and Table #227 is reserved for AGA 7 flow calculations. The structure for both tables is shown below.

Table 10–1. Structure of historical data log for DP and AGA 7 flow calculations

Field	Type	I	Description
1	Byte	I	History Log Item #1 Index
2	Byte	I	History Log Item #2 Index
3	Byte	I	History Log Item #3 Index
:	:	:	:
:	:	:	:
36	Byte	I	History Log Item #36 Index

History log index definitions for DP flow calculations are listed in the following table. Items with non-zero indices will be included in the log in the order specified.

Table 10–2. DP flow calculation history log index definitions

History Log Index	Definition
0	Undefined
1	Pipe Diameter (Snapshot)
2	Orifice Diameter (Snapshot)
3	Atmospheric Pressure (Snapshot)
4	Pressure Base (Snapshot)
5	Temperature Base (Snapshot)
6	Average Differential Pressure
7	Average Static Pressure
8	Average Gas Temperature
9	Flow Status (Snapshot)
10	Accumulated Volume (Current Log Period)

History Log Index	Definition
11	Accumulated Energy (Current Log Period)
12	Hourly Flow Rate (Snapshot)
13	Daily Flow Rate (Snapshot)
14	Hourly Energy Rate (Snapshot)
15	Daily Energy Rate (Snapshot)
16	Totalized Volume (Snapshot Non-resettable Accumulator)
17	Current Day Volume (Snapshot)
18	Current Day Energy (Snapshot)
19	Flow Time (Minutes) (Current Log Period)
20	Today Flow Time (Minutes) (Snapshot)
21	Average Square Root Extension
22	Average C' Prime
23	Average Fwv Water Content
24	Average Fwv Correction Factor
25	Average Full Well Stream Correction Factor
26	Average Fpwl Factor
27	Average BTU
28	Average Gravity
29	Average Methane Content
30	Average Nitrogen Content
31	Average Carbon Dioxide Content
32	Average Ethane Content
33	Average Propane Content
34	Average Water Content
35	Average Hydrogen Sulfide Content
36	Average Hydrogen Content
37	Average Carbon Monoxide Content
38	Average Oxygen Content
39	Average I-Butane Content
40	Average N-Butane Content
41	Average I-Pentane Content
42	Average N-Pentane Content
43	Average C6+ Content

History Log Index	Definition
44	Average N-Hexane Content
45	Average N-Heptane Content
46	Average N-Octane Content
47	Average N-Nonane Content
48	Average N-Decane Content
49	Average Helium Content
50	Average Argon Content
51	Average Air Content
52	Calculation ID
53–255	Undefined

History log index definitions for AGA 7 flow calculations are listed in the following table. Items with non-zero indices will be included in the log in the order specified.

Table 10–3. AGA 7 flow calculation history log index definitions

History Log Index	Definition
0	Undefined
1	Pipe Diameter (Snapshot)
2	Average Meter Factor
3	Atmospheric Pressure (Snapshot)
4	Pressure Base (Snapshot)
5	Temperature Base (Snapshot)
6	Accumulated Pulses
7	Average Static Pressure
8	Average Gas Temperature
9	Flow Status (Snapshot)
10	Accumulated Volume (Current Log Period)
11	Accumulated Energy (Current Log Period)
12	Hourly Flow Rate (Snapshot)
13	Daily Flow Rate (Snapshot)
14	Hourly Energy Rate (Snapshot)
15	Daily Energy Rate (Snapshot)

History Log Index	Definition
16	Totalized Volume (Snapshot Non-resettable accumulator)
17	Current Day Volume (Snapshot)
18	Current Day Energy (Snapshot)
19	Flow Time (Current Log Period)
20	Today Flow Time (Snapshot)
21	Actual Accumulated Volume (Current Log Period)
22	Average Volume Correction Factor
23	Average Fwv Water Content
24	Average Fwv Correction Factor
25	Average Full Well Stream Correction Factor
26	Average Fpwl Factor
27	Average BTU
28	Average Gravity
29	Average Methane Content
30	Average Nitrogen Content
31	Average Carbon Dioxide Content
32	Average Ethane Content
33	Average Propane Content
34	Average Water Content
35	Average Hydrogen Sulfide Content
36	Average Hydrogen Content
37	Average Carbon Monoxide Content
38	Average Oxygen Content
39	Average I-Butane Content
40	Average N-Butane Content
41	Average I-Pentane Content
42	Average N-Pentane Content
43	Average C6+ Content
44	Average N-Hexane Content
45	Average N-Heptane Content
46	Average N-Octane Content
47	Average N-Nonane Content
48	Average N-Decane Content

History Log Index	Definition
49	Average Helium Content
50	Average Argon Content
51	Average Air Content
52	Average M Correction Factor
53	Main Rotor Pulses
54	Sensor Rotor Pulses
55	Average Delta A Deviation
56	Average Main Rotor Factor
57	Average Sensor Rotor Factor
58	Calculation ID
59–255	Undefined

Security

Table #213 is a table of passwords that allows you to configure user IDs, passwords, and security access levels. The four access levels are:

- Supervisor: The highest security access level. Allows for access to calibration data and modification of all configuration parameters, including passwords.
- Technician: Second highest level of security access. Identical to Supervisor, except cannot modify passwords.
- Control: Can access tables pertaining to control functions only, PID for example.
- Measurement: Can access tables pertaining to measurement functions only, DP flow calculation for example.

A valid user ID and password must be entered for all access levels. If an invalid entry is made, the instrument returns to scrolling through the display list. Refer to the AutoCONFIG software help for instructions on how to set user IDs, passwords, and security access levels. The help system also provides a list of the default security access levels.

When users log in, flow is not affected unless the unit is in maintenance mode. Before entering maintenance mode, the unit asks the user if the inputs should be frozen.

Communication Functions

The AutoPILOT PRO flow computer uses one communications port definition block per serial port. The block can be used to specify the port as a Master or slave. When in Master mode, the communications block references contain pointers to any combination of the following types of Master blocks:

- Modbus master communications blocks – Read/Write Modbus Data
- Smart transducer communications blocks – Read Smart Transducer Data
- Chromatograph communications blocks – Read Gas Quality Data
- Tank gauge communications blocks – Read Tank Gauge Data

When in slave mode, the communications block references contain pointers to a list of Modbus slave communications blocks and optionally an alarm callout block.

Table 10–4. Table #96: Communications port definition table

Field	Description
1	Communications Port Descriptor Text – Text Table Index (16-character ASCII string)
2	Communications Port Mode: 0 = Master Mode 1 = Slave Mode
3	Communications Port Enable: 0 = Port Disabled 1 = Port Enabled
4	Communications Port Baud Rate: 0 = 300 1 = 600 2 = 1200 3 = 2400 4 = 4800 5 = 9600 6 = 19200 7 = 38400 8 = 76800 9 = 115200
5	Communications Port Data Bits: 0 = 7 bits 1 = 8 bits

Field	Description
6	Communications Port Parity: 0 = None 1 = Even 2 = Odd 3 = Mark
7	Communications Port Stop Bits: 0 = 1 1 = 1.5 2 = 2
8	Communications Port RTS Delay (milliseconds) 10 msec. Resolution
9	Communications Port Handshaking: 0 = None 1 = RTS/CTS
10	Master Mode Repeat Timer (seconds)
11	Slave Mode Communications Address
12	Slave Mode Write Enable: 0 = Write Disabled 1 = Write Enabled
13	Slave Mode Protocol Format: 0 = Modbus ASCII 1 = Modbus RTU
14	Slave Mode Communications Options (Bit Encoded)
15	Slave Mode Callout Block Index
16	Slave Mode Password #1 Modbus Register Number
17	Slave Mode Password #1 Value
18	Slave Mode Password #1 Security Access Mask: Bit 0 = Operator Access Bit 1 = Supervisor Access Bit 2 = Maintenance Access Bit 3 = Engineer Access Bits 4–7 = Undefined
19	Slave Mode Password #2 Modbus Register Number
20	Slave Mode Password #2 Value
21	Slave Mode Password #2 Security Access Mask
22	Slave Mode Password #3 Modbus Register Number
23	Slave Mode Password #3 Value

Field	Description
24	Slave Mode Password #3 Security Access Mask
25	Slave Mode Password #4 Modbus Register Number
26	Slave Mode Password #4 Value
27	Slave Mode Password #4 Security Access Mask
28	Slave Mode Password #5 Modbus Register Number
29	Slave Mode Password #5 Value
30	Slave Mode Password #5 Security Access Mask
31	Master/Slave Communications Block Reference #1
32	Master/Slave Communications Block Reference #2
33	Master/Slave Communications Block Reference #3
:	:
:	:
286	Master/Slave Communications Block Reference #256

Table 10–5. Table #97: Modbus slave communication block table

Field	Description
1	Modbus Slave Starting Register Number
2	Number of Registers (in this block)
3	Write Enable: 0 = Write Disabled 1 = Write Enabled (Does not apply for Historical Data Block Reference or Alarm/Audit Log Data Block Reference)
4	Register Format: 0 = Discrete 1 = 32-Bit Floating Point – 32-Bit Register 2 = 32-Bit Floating Point – 2 16-Bit Register 3 = 16-Bit Word 4 = Byte (Does not apply for Historical Data Block Reference or Alarm/Audit Log Data Block Reference)
5	Modbus Register Item #1 (Starting Register Number + 0)
6	Modbus Register Item #2 (Starting Register Number + 1)
7	Modbus Register Item #3 (Starting Register Number + 2)
:	:

Field	Description
104	Modbus Register Item #100 (Starting Register Number + 99)

Table 10–6. Table #98: Modbus master communication block table

Field	Description
1	Modbus Master Communications Enable: 0 = Disabled 1 = Enabled
2	Modbus Master Communications Type: 0 = Read 1 = Write
3	Modbus Master Communications Address
4	Modbus Master Communications Status: 0 = Communications OK 1 = Illegal Function 2 = Illegal Data Address 3 = Illegal Data Value 4 = No Response 5 = Transmit Failure
5	Modbus Master Communications Options (Bit Encoded): 0 = 32-Bit Float 1 = 16-Bit Float #1 2 = 16-Bit Float #2 3 = AutoMITTER
6	Modbus Master Communications Protocol Format: 0 = Modbus ASCII 1 = Modbus RTU
7	Modbus Master Starting Register Number
8	Number of Registers (in this block)
9	Modbus Register Item #1 (Starting Register Number + 0)
10	Modbus Register Item #2 (Starting Register Number + 1)
11	Modbus Register Item #3 (Starting Register Number + 2)
:	:
:	:
58	Modbus Register Item #50 (Starting Register Number + 49)

Chapter 11
Maintenance

Warning For hazardous area installations: In the event of a fault condition, the AutoPILOT PRO flow computer cannot be serviced by the customer. No repair to faulty assemblies should be attempted. Faulty assemblies must be replaced with identical replacements. All repairs or part replacements must be done by Thermo Fisher or its appointed repair agent. Contact Thermo Fisher for instructions. ▲

Replacing the Main Board

Follow the procedure below to replace the main board.

Warning Ensure power is off and the area is non-hazardous before performing this procedure. ▲

Tip The procedure for replacing the main board is the same for metal and fiberglass enclosures. ▲

1. Open the enclosure door, and reference Figure 11–1 for these steps:
   a. Remove the Honeywell EPROM from the main board. Do not discard it, as you will need to install it on the replacement board.
   b. Remove the three screws holding the main board faceplate in place, and remove the faceplate. Do not discard it.
   c. Disconnect all wiring from the terminal blocks. Noting each connection will simplify the process when you are ready to connect everything to the replacement board.
   d. There are two screws installed through the main board. One connects the Q12 resistor to the chassis bracket, and the other screws into a standoff on the mounting bracket. Remove these screws.
   e. If you have the communication expansion option, there are two additional screws installed through the main board that secure the expansion board. Remove these screws.
   f. Loosen the two thumbscrews on the mounting bracket, and lift the main board and bracket up to expose the back of the main board.

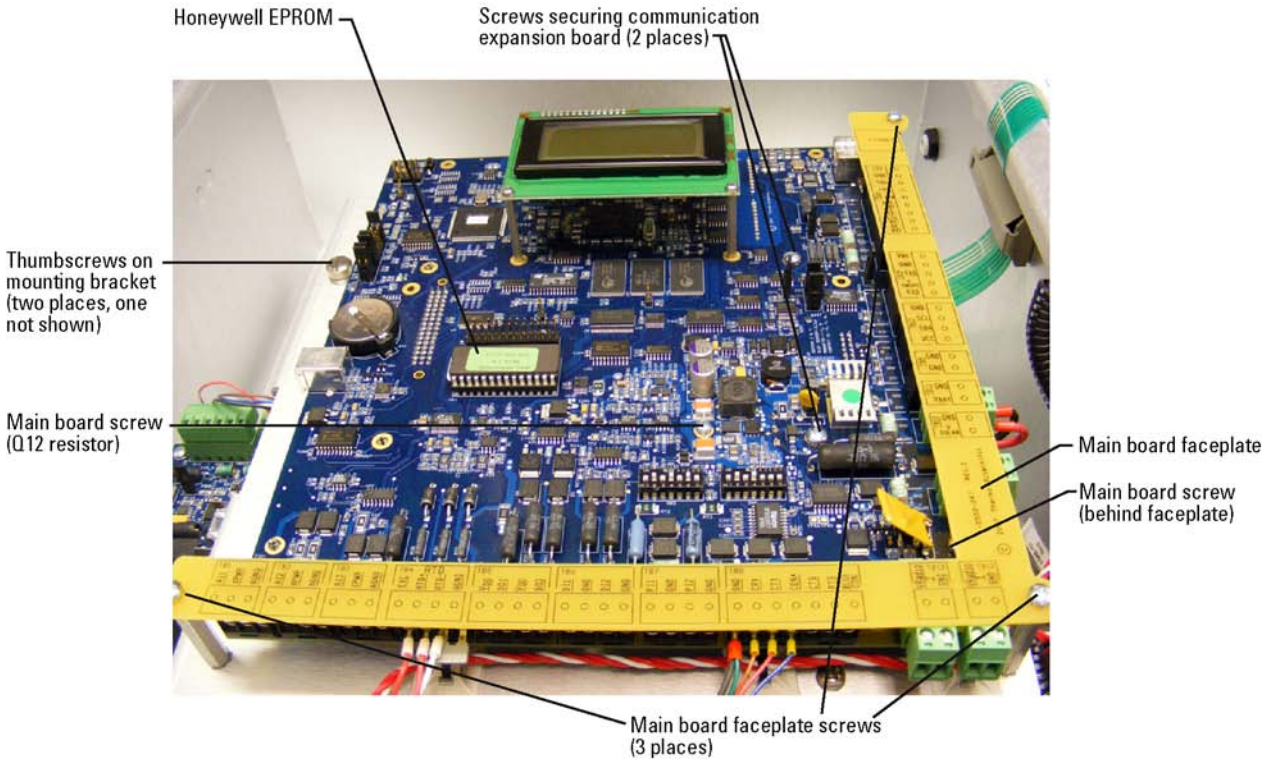
Honeywell EPROM
Screws securing communication expansion board (2 places)
Thumbscrews on mounting bracket (two places, one not shown)
Main board screw (Q12 resistor)
Main board faceplate
Main board screw (behind faceplate)
Main board faceplate screws (3 places)

Figure 11–1. Replacing the main board, step 1

2. With the main board and mounting bracket lifted, you can access the back of the main board.
   a. If you have the communication expansion board installed, place your fingers between the main board and its mounting bracket and onto the communication expansion board. Press the expansion board out to disengage it from the main board connector (reference Figure 5–5).
   b. Disconnect the display cable from J15 on the back of the main board.
   c. If you have the I/O expansion backplane installed, disconnect its cable from the main board at J32.
   d. If the enclosure is mounted directly onto a Honeywell transducer, disconnect the transducer's 10-pin connector from the main board at J25. You may need to remove the bracket from the wiring access in the mounting bracket (reference Figure 3–4).
3. Return the main board and mounting bracket to the down position.
4. Ensure all wiring and connections to the main board are disconnected.

5. Place your fingers between the main board and mounting bracket, and press the main board up to separate it from the mounting bracket.

6. To install the new board:
   a. Align it with the standoffs on the mounting bracket. Gently press the main board down until it snaps into place.
   b. Install the two main board screws.
   c. Install the Honeywell EPROM.
   d. Connect wiring to the main board terminal blocks.
   e. Align the main board faceplate, and secure it with the three screws.

7. Lift the main board and mounting bracket up to expose the back of the main board.
   a. Connect the display cable to J15 on the back of the main board.
   b. If you have the I/O expansion backplane installed, connect the cable to J32.
   c. If the enclosure is mounted onto a Honeywell transducer, connect the transducer cable to J25. If you removed the bracket covering the wiring access hole in the mounting bracket, replace it.
   d. If the communication expansion board was installed, mount it onto the new board, connecting it at J29.

8. Return the main board and mounting bracket to the down position. Tighten the two thumbscrews on the mounting bracket.

9. If you installed the communication expansion board, replace the two screws that secure it to the main board.

10. Ensure all wiring is reconnected to the main board.

11. Shut the enclosure door.

Replacing Option Boards

To replace an option board, follow this general procedure.

Warning Ensure power is off and the area is non-hazardous before performing this procedure. ▲

1. Open the enclosure door.
2. Locate the option board you want to replace. You may need to lift the main board and mounting bracket.
3. Disconnect all wiring and connections from the board, and remove it.
4. Reference the chapter on the option board you removed for installation and wiring of the new board.
   - MEBs: Chapter 4
   - Analog input or communication expansion options: Chapter 5
   - AutoMITTER SIB: Chapter 6
5. If necessary, return the main board and mounting bracket to the down position, and shut the enclosure door.

Replacing the Backup Battery

The Lithium backup battery is located at BT1 on the front of the main board. It is a field replaceable item.

Warning The Lithium battery may explode if mistreated. Do not attempt to recharge, disassemble, or burn it. ▲

Warning Ensure power is off and the area is non-hazardous before performing this procedure. ▲

1. Open the enclosure door.
2. Gently lift up the battery retainer and lift the battery out.
3. Install the new battery, ensuring it is secured by the retainer.
4. Shut the enclosure door.

Upgrading the Firmware

1. Use the AutoCONFIG software to connect to the flow computer whose firmware you want to upgrade.

2. From the main menu, go to **System > Flash RTU**.

3. Browse to the location where you stored the S19 file, and double-click the file.

4. The software will ask if you want to perform the task, as all data will be erased. Click Yes.

5. The flow computer will display the status of the firmware upgrade. If communication is not established or is lost during the flashing process, follow these steps to reestablish communications with the unit.

   a. Use the AutoCONFIG software to warm boot the RTU (**Tools > Warm Restart**). If the flow computer finds that the application image is invalid, "AutoPilot Pro B-2" should be displayed on the LCD.

   b. An alternate method of warm booting the flow computer is to set a jumper on J39 pins 5 and 6 on the main board. The flow computer will display "AutoPilot Pro B-5" on the LCD, indicating that the bootloader has control.

   c. Try to connect to the flow computer. The software will attempt to establish communication again and fail because the flow computer is already in the bootloader. These communication timeouts are normal.

   d. Once the flow computer fails communications and a blank screen is presented, select **File > Flash RTU**.

   e. At the prompt, select the new flash file. The flow computer will fail several more times (again because the flow computer is already in the bootloader) and then will resume reflashing the flow computer normally.

6. Upon completion, the flow computer will display that the download is complete, and the software will inform you that the download has been successful. Click OK. If you installed a jumper on J39 pins 5 and 6, remove it now.

7. Establish communications with the flow computer. The No Display List screen will appear on the flow computer display. You will need to re-enable any calculations that were running before the upgrade.

Chapter 12
Getting Help

Contact Information

If the unit is not performing satisfactorily, the local representative is your first contact for support and is well equipped to answer questions and provide application assistance. You can also contact Thermo Fisher directly at any of the locations below.

Process Instruments		
1410 Gillingham Lane Sugar Land, TX 77478 USA +1 (800) 437-7979 +1 (713) 272-0404 direct +1 (713) 4573 fax	14 Gormley Industrial Avenue Gormley, Ontario L0H 1G0 CANADA +1 (905) 888-8808 +1 (905) 888-8828 fax	Unit 702-715, 7/F Tower West Yonghe Plaza No. 28 Andingmen East Street, Beijing 100007 CHINA +86 (10) 8419-3588 +86 (10) 8419-3580 fax
A-101, 1CC Trade Tower Senapati Bapat Road Pune 411 016 Maharashtra, INDIA +91 (20) 6626 7000 +91 (20) 6626 7001 fax	Ion Path, Road Three Winsford, Cheshire CW7 3GA UNITED KINGDOM +44 (0) 1606 548700 +44 (0) 1606 548711 fax	
www.thermoscientific.com		

Warranty

Thermo Scientific products are warranted to be free from defects in material and workmanship at the time of shipment and for one year thereafter. Any claimed defects in Thermo Scientific products must be reported within the warranty period. Thermo Fisher shall have the right to inspect such products at Buyer's plant or to require Buyer to return such products to Thermo Fisher plant.

In the event Thermo Fisher requests return of its products, Buyer shall ship with transportation charges paid by the Buyer to Thermo Fisher plant. Shipment of repaired or replacement goods from Thermo Fisher plant shall be F.O.B. Thermo Fisher plant. A quotation of proposed work will be sent to the customer. Thermo Fisher shall be liable only to replace or repair, at its option, free of charge, products that are found by Thermo Fisher to be defective in material or workmanship, and which are reported to Thermo Fisher within the warranty period as provided above. This right to replacement shall be Buyer's exclusive remedy against Thermo Fisher.

Thermo Fisher shall not be liable for labor charges or other losses or damages of any kind or description, including but not limited to, incidental, special or consequential damages caused by defective products. This warranty shall be void if recommendations provided by Thermo Fisher or its Sales Representatives are not followed concerning methods of operation, usage and storage or exposure to harsh conditions.

Materials and/or products furnished to Thermo Fisher by other suppliers shall carry no warranty except such suppliers' warranties as to materials and workmanship. Thermo Fisher disclaims all warranties, expressed or implied, with respect to such products.

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Appendix A
Ordering Information

Replacement Parts

Table A–1. Main board

Part Number	Description
3-0500-003	AutoPILOT PRO main board, Div. 2
5-3980-015	Lithium backup battery

Table A–2. MEB & I/O expansion options

Part Number	Description
3-0443-918	AutoMITTER SIB, CSA
3-0443-1021	AutoMITTER SIB, ATEX/Brazilian installations
3-0459-087	12/24 Vdc converter board, Div. 2
3-0480-163	2-PI MEB, Div. 2
3-0480-256	4-DI MEB
3-0480-261	4-DO MEB
3-0485-157	2-D/A MEB, Div. 2
3-0485-198	2-DI/DO MEB, Div. 2
3-0500-006	Communication expansion board
3-0500-009	Analog input expansion board, Div. 2
3-0500-035	Analog input expansion board, Div. 1
3-0500-040	I/O expansion backplane
3-0500-043	Communication terminal board
3-0500-046	Analog input expansion terminal board

Transducer Options

The flow computer enclosure can be mounted directly onto a Honeywell smart transducer. These transducer options are listed below.

Table A–3.

Part Number	Description
3-0500-051	Transducer, MVX2000, 1500 psia, 400", CS
3-0500-051	Transducer, MVX3000, 3000 psig, 400", CS
3-0500-053	Transducer, MVX3000, 3000 psig, 400", SS
3-0500-078	Transducer, MVX2000, 1500 psia, 400", SS
3-0500-079	Transducer, MVX3000, 3000 psig, 400", SS, NACE

Kits

Table A–4.

Part Number	Description
3-0485-493	Kit, direct mount for fiberglass enclosures
3-0488-022	Kit, 2" pole mount for fiberglass enclosures
3-0500-017	Kit, battery mounting hardware (for internal battery option)
3-0500-023	Kit, 2" pole mount for metal enclosures
3-0500-024	Kit, direct mount for metal enclosures
3-0500-025	Kit, communication expansion board
3-0500-026	Kit, analog input expansion board
3-0500-029	Kit, I/O expansion backplane
3-0500-063	Kit, AutoMITTER SIB, CSA, for fiberglass enclosures
3-0500-064	Kit, AutoMITTER SIB, ATEX/Brazilian installations
3-0500-065	Kit, 2-D/A MEB, Div. 2
3-0500-066	Kit, 2-DI/DO MEB, Div. 2
3-0500-067	Kit, 4-DI MEB
3-0500-068	Kit, 4-DO MEB
3-0500-069	Kit, 2-PI MEB, Div. 2
3-0500-071	Kit, 212A modem ready
3-0500-072	Kit, AutoWAVE radio with coaxial protector
3-0500-073	Kit, AutoWAVE radio ready with coaxial protector
3-0500-080	Kit 12/24 Vdc converter board, Div. 2
3-0500-081	Kit, MDS radio ready with coaxial protector
3-0500-093	Kit, 212A modem

Part Number	Description
3-0500-104	Kit, AutoMITTER SIB, CSA, for metal enclosures
3-0500-130	Kit, RTD probe, 10' flex armor cable
3-0500-131	Kit, RTD probe, 15' flex armor cable

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Appendix B
Specifications

Results may vary under different operating conditions.

Table B–1. System specifications

Main board	- 32-bit, 60 MHz micro computer unit. - SRAM memory for data storage, 2 MB, battery backed. - Real-time clock (RTC). - Lithium backup battery; voltage monitor for the RTC and SRAM circuits allows for data and configuration retentions in the event of power failure. - Local I/O consisting of - Three analog inputs - One 100-ohm Pt RTD input; full scale ± 0.6°F over operating temperature range - Two digital outputs - Two digital inputs - Two pulse inputs up to 10 KHz - One local serial communication port - One local Honeywell smart transducer connection - One RS232/RS485 host serial communication port - Connection for AutoMITTER Safety Interface board for communication with multiple remote Thermo Scientific AutoMITTER PRO transmitter connections - Connection for optional modular expansion boards (MEBs) - Two +12 V power supply outputs for wires communication devices. One for wireless radio and one for Bluetooth wireless module (future). - One 10/100 Ethernet communication port with ESD protection. - One USB port (future).
Display	4-line X 16-character LCD.
Keypad	4 X 4.
Temperature range	-40°C to +85°C.
Power supply	Standard 10–30 Vdc external power supply. Optional 12 V, 28 AH internal, rechargeable lead acid battery.

Table B–2. Certifications

CSA	Class I, Div. 2, Groups C & D, T3C (Tamb -40°C to +85°C)
ATEX with AutoMITTER SIB option	EPSILON 08 ATEX 2440X II 3 (1) G Ex nL [ia] IIB T4 (Tamb -40°C to +80°C)
ATEX without AutoMITTER SIB option	EPSILON 08 ATEX 2440X II 3 G Ex nL IIB T4 (Tamb -40°C to +80°C)
Brazil (INMETRO)	TÜV 11.0076X Ex nL IIB T4 Gc -40°C ≤ Ta ≤ +80°C)
FCC	47CFR part 15, Class A
Electromagnetic Compatibility	Compliant with EN 61326-1: 2006

Table B–3. I/O expansion

2-DI/DO MEB	Maximum of 6 boards per unit. DI: Provides 2 contact inputs with internal +5 Vdc wetting voltage. DO: Provides 2 open drain FET output contact closures, externally powered. Rated at +30 Vdc / 250 mA maximum.
4-DI MEB	Maximum of 6 boards per unit. Provides 4 contact inputs with internal +5 Vdc wetting voltage.
4-DO MEB	Maximum of 6 boards per unit. Provides 4 open drain FET output contact closures, externally powered. Rated at +30 Vdc / 250 mA maximum.
2-PI MEB	Maximum of 4 boards per unit. Provides 2 pulse inputs configurable for slot sensor, magnetic pick-up, or dry contact inputs. Maximum 10 KHz.
2-D/A (Dual Analog Output) MEB	Maximum of 4 boards per unit. Provides 2 outputs, 1–5 V or 4–20 mA. Powered by battery or external +24 Vdc.

AI Expansion	Expansion option consists of 1 AI expansion board and up to 4 AI terminal boards. Each terminal board provides 4 inputs with 14-bit resolution, 0–5 V. Current input 4–20 mA can be converted to voltage input by an external 250-ohm resistor. Full scale ± 0.1% over operating temperature range. Acceptable overrange ± 10% as -0.5 to 5.5 V, overvoltage protection up to +24 V. Power output: 9 Vdc/80 mA. Inputs protected against 6000 volt/3000 amp transients. Requires the I/O expansion backplane.
Comm. Expansion Option	Expansion option consists of 1 comm. expansion board and up to 4 comm. terminal boards. Comm. expansion board adds 8 RS232/RS485 ports and 2 USB ports (1 host, 1 OTG). Each comm. terminal board adds 2 RS232/RS485 serial ports. Requires the I/O expansion backplane.
AutoMITTER SIB	Maximum of 1 board per unit. Provides a connection for up to four remote mounted AutoMITTER PRO units. Each AutoMITTER PRO transmitter provides temperature, differential pressure, and static pressure measurements.

Table B–4. Radio & modem options

Thermo Scientific AutoWAVE radio	1 W, 900 MHz Spread Spectrum
MDS 9810 radio	1 W, 900 MHz Spread Spectrum
Thermo Scientific 212A modem	

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Appendix C
Main Board Jumper Settings & Connections

Jumper Settings

Factory Settings

Use the table to find the factory setting (default) for the jumper. Then use the callout numbers listed in the table to locate the jumpers in the figures.

Table C–1. Factory settings for main board jumpers

Callout #	Jumper	Factory Setting
1	J39 pins 1-2	ON
	J39 pins 3-4	OFF
	J39 pins 5-6	OFF
	J39 pins 7-8	OFF
	J39 pins 9-10	OFF
	J39 pins 11-12	OFF
	J39 pins 13-14	OFF
	J39 pins 15-16	OFF
2	JP17	OFF
3	J40	OFF
4	J41	ON
5	J38	ON
6	J37	OFF
7	J36	OFF
8	J35	OFF
9	J34	OFF
10	JP9	OFF
11	JP25	OFF
12*	JP27	OFF

*JP27 on solder side of main board.

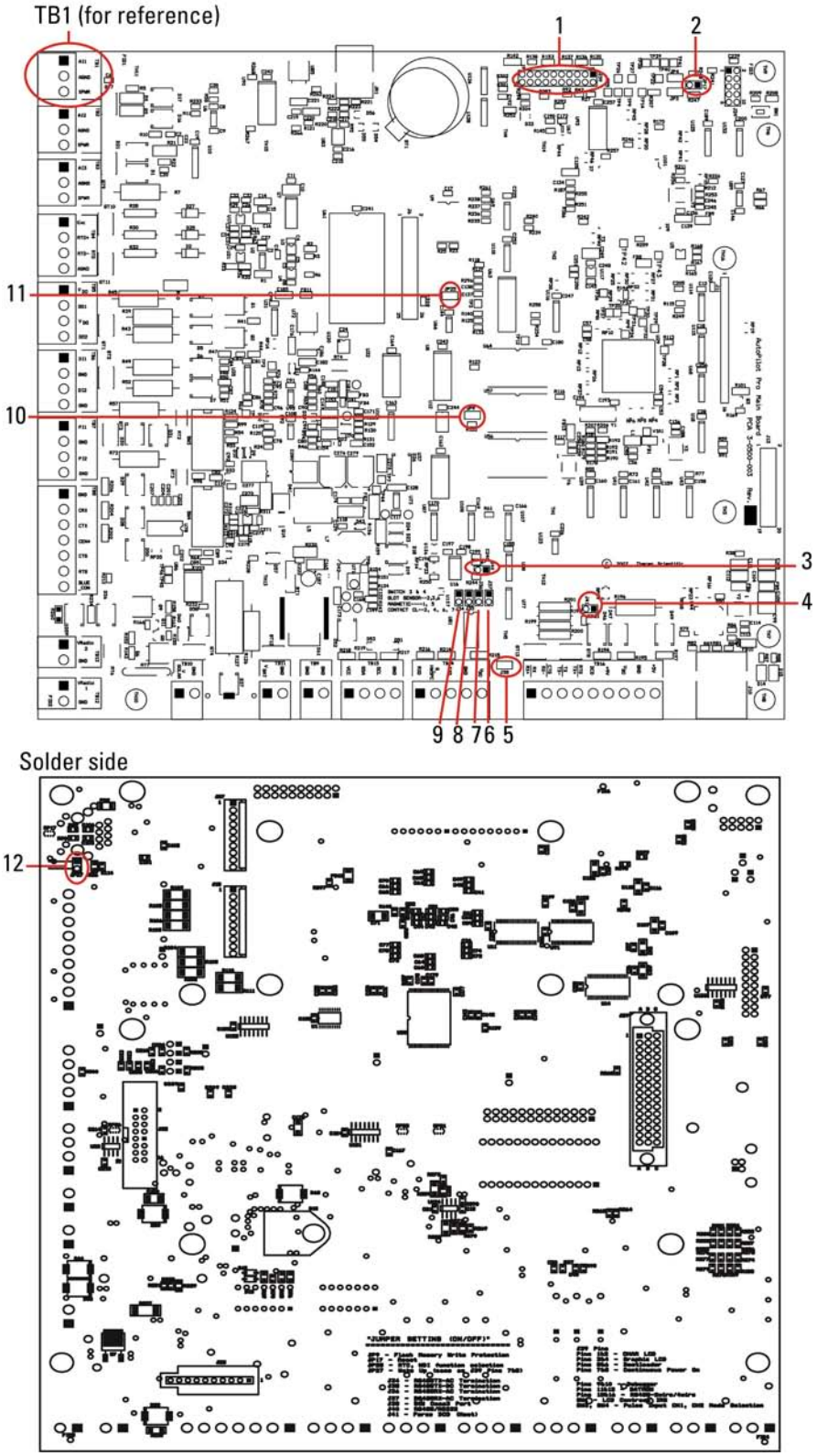

Figure C–1. Factory set jumpers on the main board

Other Settings

Table C–2. Other main board jumper settings (not factory set)

Jumper	Description	Setting for Function
JP3	Not installed. BDM 1.5V core option.	
JP4	Not installed. TCLK/PSTCLK pull down option.	
JP9	Flash memory write protection.	Install jumper for protection.
JP17	System reset.	Install jumper to reset the system.
JP25	RTC WDI function selection.	Install jumper to select WDI function.
JP27	Wake up system.	System stays on when jumper is installed.
J34	RS485 TX – AC termination.	
J35	RS485 TX – DC termination.	
J36	RS485 RX – AC termination.	
J37	RS485 RX – DC termination.	
J38	SIB selection.	Install jumper to select SIB**.**
J39 pins 1–2	Character LCD option.	Install to select the character LCD (default option).
J39 pins 3–4	Graphic LCD option.	Function not available.
J39 pins 5–6	Boot loader selection.	CPU runs the boot loader upon power-up when the jumper is installed.
J39 pins 7–8	Continuous power on.	System stays in wake-up mode when the jumper is installed.
J39 pins 9–10	Debugger selection.	CPU runs the debugger upon power-up when the jumper is installed. Function not available.
J39 pins 11–12	Memory backup battery on.	The backup battery is connected to memory and RTC chip when the jumper is installed.
J39 pins 13–14	No current use.	
J39 pins 15–16	RS485 2-wire / 4-wire option.	Install the jumper for 2-wire mode.
J40	RS485 / RS232 mode selection.	Install the jumper for RS485 mode.
J41	Force DCD for the host comm. port.	Install the jumper to force the host comm. port DCD to HIGH.
SW1	LCD Contrast IRQ (optional)	The LCD contrast is also controlled through the keypad.
SW3	Pulse input mode option (CH1).	Magnetic sensor mode: 1, 5 = ON. Slot sensor mode: 2, 3, 6 = ON. Contact closure mode: 2, 4, 6, 7 = ON.

Jumper	Description	Setting for Function
SW4	Pulse input mode option (CH3).	Magnetic sensor mode: 1, 5 = ON. Slot sensor mode: 2, 3, 6 = ON. Contact closure mode: 2, 4, 6, 7 = ON.

Connectors

Table C–3. Main board connectors

Callout	Connector	Description	Comment
1	TB1	Local analog input, CH 1	
2	TB2	Local analog input, CH 2	
3	TB3	Local analog input, CH 3	
4	TB4	Local RTD, temperature sensor input	
5	TB5	Local discrete output, CH 1–2	
6	TB6	Local discrete input, CH 1–2	
7	TB7	Local pulse input, CH 1–2	
8	TB8	Local serial comm. port	
9	TB13	+12 V power supply to Radio2	For Bluetooth®
10	TB12	+12 V power supply to Radio1	For wireless radio
11	TB10	Solar charger power input	From solar panel
12	TB11	Main board power supply input	Also connects to solar charger output
13	TB9	GND terminal block	
14	TB15	MEB interface connections	I^2C port
15	TB14	AutoMITTER SIB connection	AutoMITTER PRO transmitter connections
16	TB16	Host serial comm. port	Supports RS232 and RS485
17	J10	Ethernet port	10M/100M Ethernet
18	J27	Comm3 port	Remote Honeywell transducer and RTD
19	JR1	USB port	
20	J29	Communication expansion board connector	Solder side of main board
21	J32	I/O expansion backplane connector	Solder side of main board
22	J25	Local Honeywell smart transducer connector	Solder side of main board

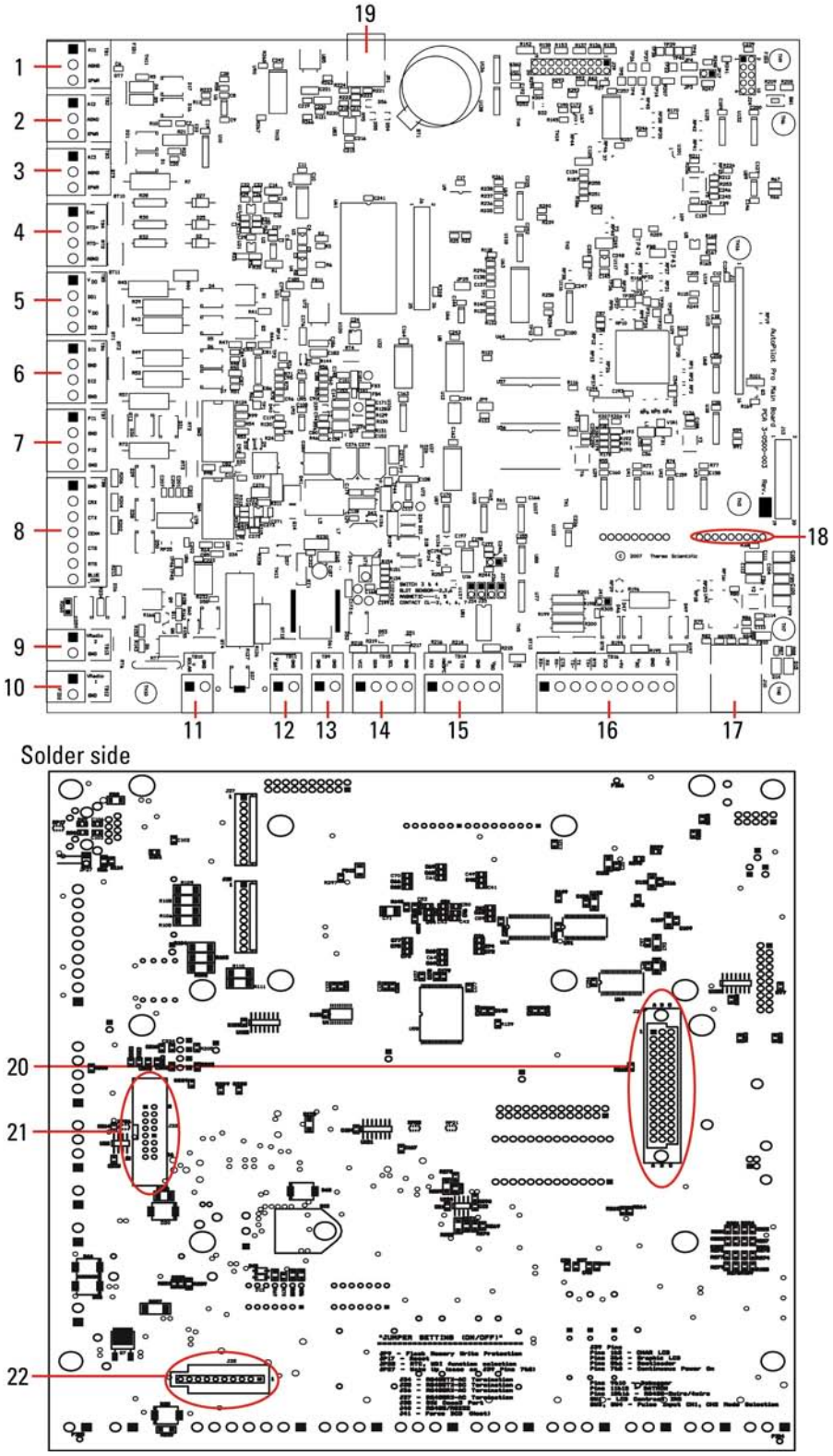

Figure C–2. Connectors on the main board

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Appendix D
Wiring Quick Start

Note Information presented in this chapter has been regenerated from original drawings. Every effort is made to maintain document accuracy. However, in order to enhance legibility, the documents may have been restructured, and some information may have been intentionally excluded. Therefore, the drawings within this guide may not be exact duplicates of the original drawings. ▲

Note Drawings in this manual are included for reference only and may not be the current version. Contact the factory if you need a copy of the latest revision. ▲

Table D–1. General assembly drawing

Drawing #	Rev.	Description	Page
0-0500-114	B	AutoPILOT PRO flow computer general assembly drawing, CSA	D-4

(For discussion, reference Chapter 3.)

Table D–2. External battery enclosures & wiring diagrams

Drawing #	Rev.	Description	Page
8-0500-082	A	External battery system assembly drawing	D-8
8-0500-083	A	External battery system with ASC regulator assembly drawing	D-9

(For discussion, reference Chapter 2 and Chapter 3.)

Table D–3. Main board connectors & typical wiring

Drawing #	Rev.	Description	Page
4-0500-003	B	AutoPILOT PRO main board connectors	D-10
--	-	TB1–TB3: Typical analog input wiring for low-power transmitter	D-12
--	-	TB4: Typical RTD connections	D-12
--	-	TB5: Typical discrete output wiring	D-13
--	-	TB6: Typical discrete input wiring	D-13
--	-	TB7: Typical pulse input wiring	D-14
--	-	TB12: **See radio connections in Table D–5**	--
--	-	TB10: Solar panel wiring for internal battery option	D-14
--	-	TB11: System power supply input to power distribution terminal block	D-15
0-0500-106	A	Basic system wiring diagram: Power supply input (TB11) and ground stud	D-15
--	-	TB15: **See MEB interface connector in Table D–4**	--
--	-	TB14: **See SIB connections in Table D–6**	--
--	-	TB16: Typical host serial communication port wiring (also see modem and radio connections in Table D–5)	D-16

(For discussions, reference Chapter 2, Chapter 4 for MEB, Chapter 6 for AutoMITTER SIB, Chapter 7 for radio options, or Chapter 8 for 212A modem.)

Table D–4. Modular expansion boards (MEBs)

Drawing #	Rev.	Description	Page
--	-	MEB interface connector (main board TB15) to MEB terminal block	D-17
0-0500-106	A	Wiring diagram for MEB interface connector (TB15)	D-17
--	-	MEB installation locations	D-18
--	-	Typical output connections to the 2-D/A MEB	D-18
3-0500-065	A	2-D/A MEB wiring diagram, Div. 2	D-19
--	-	Typical discrete output wiring for 2-DI/DO MEB or 4-DO MEB	D-20
--	-	Typical discrete input wiring for 2-DI/DO MEB or 4-DI MEB	D-20
3-0500-066	A	2-DI/DO MEB wiring diagram, Div. 2	D-21
3-0500-067	A	4-DI MEB wiring diagram	D-22
3-0500-068	A	4-DO MEB wiring diagram	D-23
--	-	Typical pulse input wiring for 2-PI MEB	D-24

Drawing #	Rev.	Description	Page
3-0500-069	A	2-PI MEB wiring diagram	D-25
3-0500-080	A	12/24 Vdc converter board wiring diagram, Div. 2	D-26

(For discussion, reference Chapter 4.)

Table D–5. Modem & radio options

Drawing #	Rev.	Description	Page
--	-	212A modem installation and wiring	D-27
3-0500-071	A	212A modem ready wiring diagram	D-28
3-0500-093	A	212A modem wiring diagram	D-29
--	-	AutoWAVE radio installation and wiring	D-30
3-0500-072	A	AutoWAVE radio wiring diagram	D-31
3-0500-073	A	AutoWAVE radio ready wiring diagram	D-32
--	-	MDS radio installation and wiring	D-33
3-0500-081	A	MDS radio wiring diagram	D-34

(For discussions, reference Chapter 7 for radio options or Chapter 8 for 212A modem.)

Figure D–3. Other expansion options

Drawing #	Rev.	Description	Page
4-0500-040	B	Connectors on the I/O expansion backplane	D-35
3-0500-026	A	Installing the I/O expansion backplane for the analog input expansion (AI) board option	D-35
--	-	Typical analog input wiring for the AI expansion board	D-36
--	-	Connecting the communication expansion board to the I/O expansion backplane and the AutoPILOT PRO main board	D-36
--	-	System setup for RS232 mode	D-37
--	-	System setup for RS485 mode	D-38
--	-	AutoMITTER safety interface board (SIB) to AutoPILOT PRO flow computer wiring, ATEX/Brazilian installations	D-39
0-0497-516	A	AutoMITTER PRO transmitter wiring diagram, ATEX/Brazilian installations	D-40
--	-	AutoMITTER SIB to AutoPILOT PRO flow computer wiring, CSA version	D-42
0-0497-517	A	AutoMITTER PRO transmitter wiring diagram, CSA version	D-43

For discussions, reference Chapter 5 for AI and communication expansion options and Chapter 6 for AutoMITTER SIB.

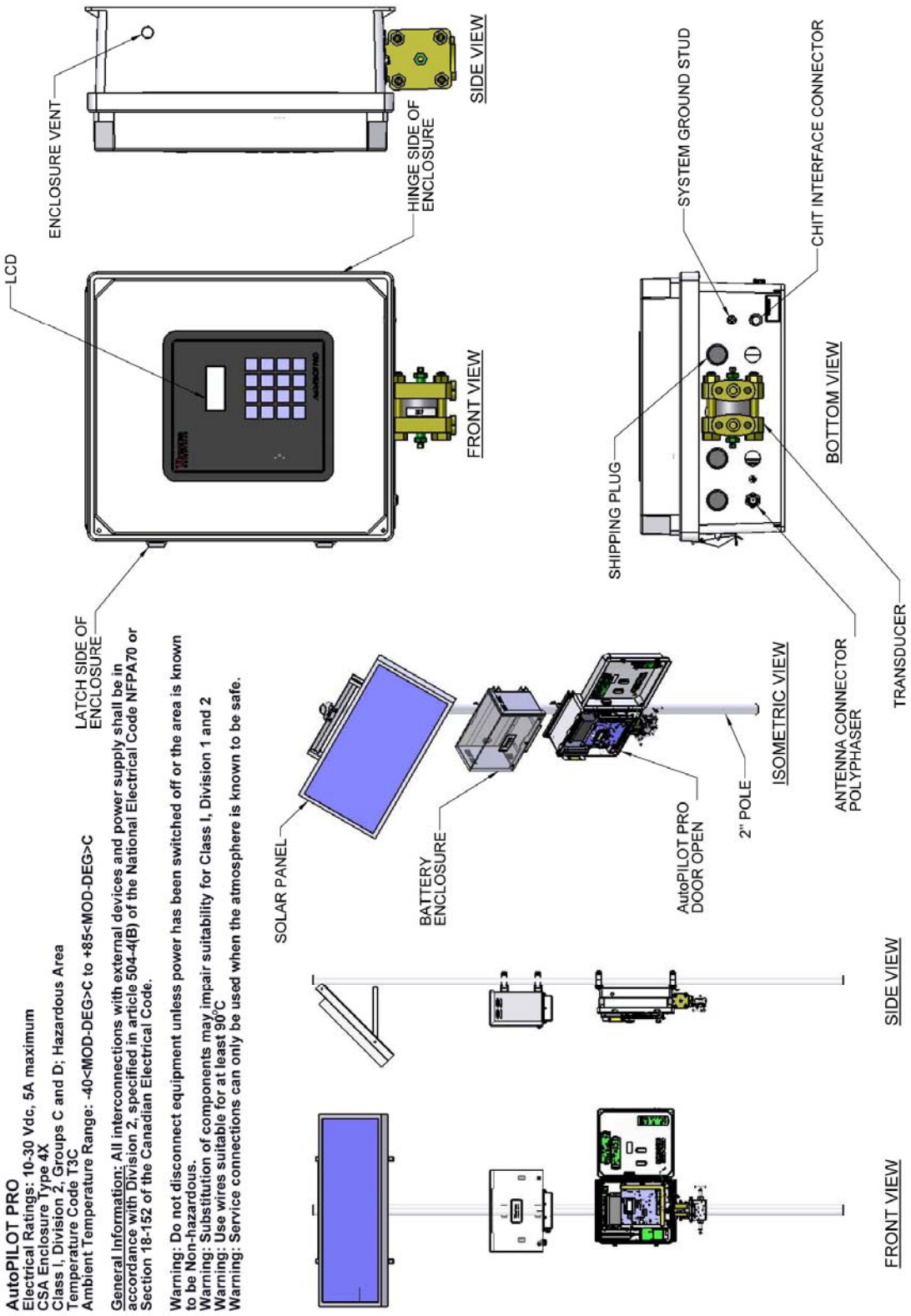

ENCLOSURE VENT
HINGE SIDE OF ENCLOSURE
SIDE VIEW
LCD
FRONT VIEW
LATCH SIDE OF ENCLOSURE
SYSTEM GROUND STUD
CHIT INTERFACE CONNECTOR
SHIPPING PLUG
BOTTOM VIEW
TRANSDUCER
ANTENNA CONNECTOR POLYPHASER
ISOMETRIC VIEW
2" POLE
AutoPILOT PRO DOOR OPEN
BATTERY ENCLOSURE
SOLAR PANEL
SIDE VIEW
FRONT VIEW
AutoPILOT PRO
Electrical Ratings: 10-30 Vdc, 5A maximum
CSA Enclosure Type 4X
Class I, Division 2, Groups C and D; Hazardous Area
Temperature Code T3C
Ambient Temperature Range: -40<MOD-DEG>C to +85<MOD-DEG>C
General Information: All interconnections with external devices and power supply shall be in accordance with Division 2, specified in article 504-4(B) of the National Electrical Code NFPA70 or Section 18-152 of the Canadian Electrical Code.
Warning: Do not disconnect equipment unless power has been switched off or the area is known to be Non-hazardous.
Warning: Substitution of components may impair suitability for Class I, Division 1 and 2
Warning: Use wires suitable for at least 90°C
Warning: Service connections can only be used when the atmosphere is known to be safe.

Figure D–1. 0-0500-114: AutoPILOT PRO flow computer general assembly drawing, CSA (sheet 1 of 4)

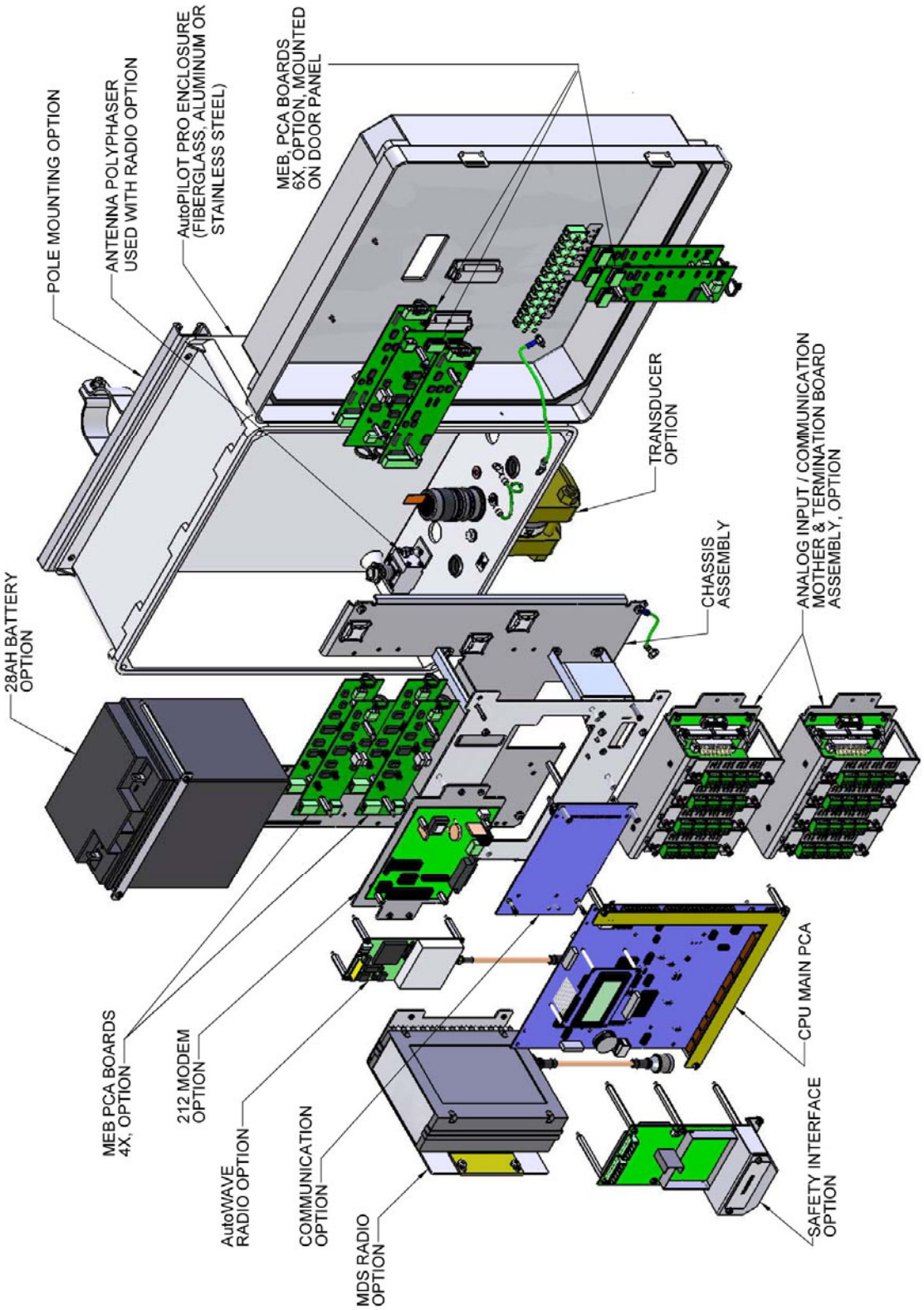

POLE MOUNTING OPTION
ANTENNA POLYPHASER USED WITH RADIO OPTION
AutoPILOT PRO ENCLOSURE (FIBERGLASS, ALUMINUM OR STAINLESS STEEL)
MEB, PCA BOARDS 6X, OPTION, MOUNTED ON DOOR PANEL
TRANSDUCER OPTION
CHASSIS ASSEMBLY
ANALOG INPUT / COMMUNICATION MOTHER & TERMINATION BOARD ASSEMBLY, OPTION
28AH BATTERY OPTION
MEB PCA BOARDS 4X, OPTION
212 MODEM OPTION
AutoWAVE RADIO OPTION
COMMUNICATION OPTION
MDS RADIO OPTION
CPU MAIN PCA
SAFETY INTERFACE OPTION

Figure D–2. 0-0500-114: AutoPILOT PRO flow computer general assembly drawing, CSA (sheet 2 of 4)

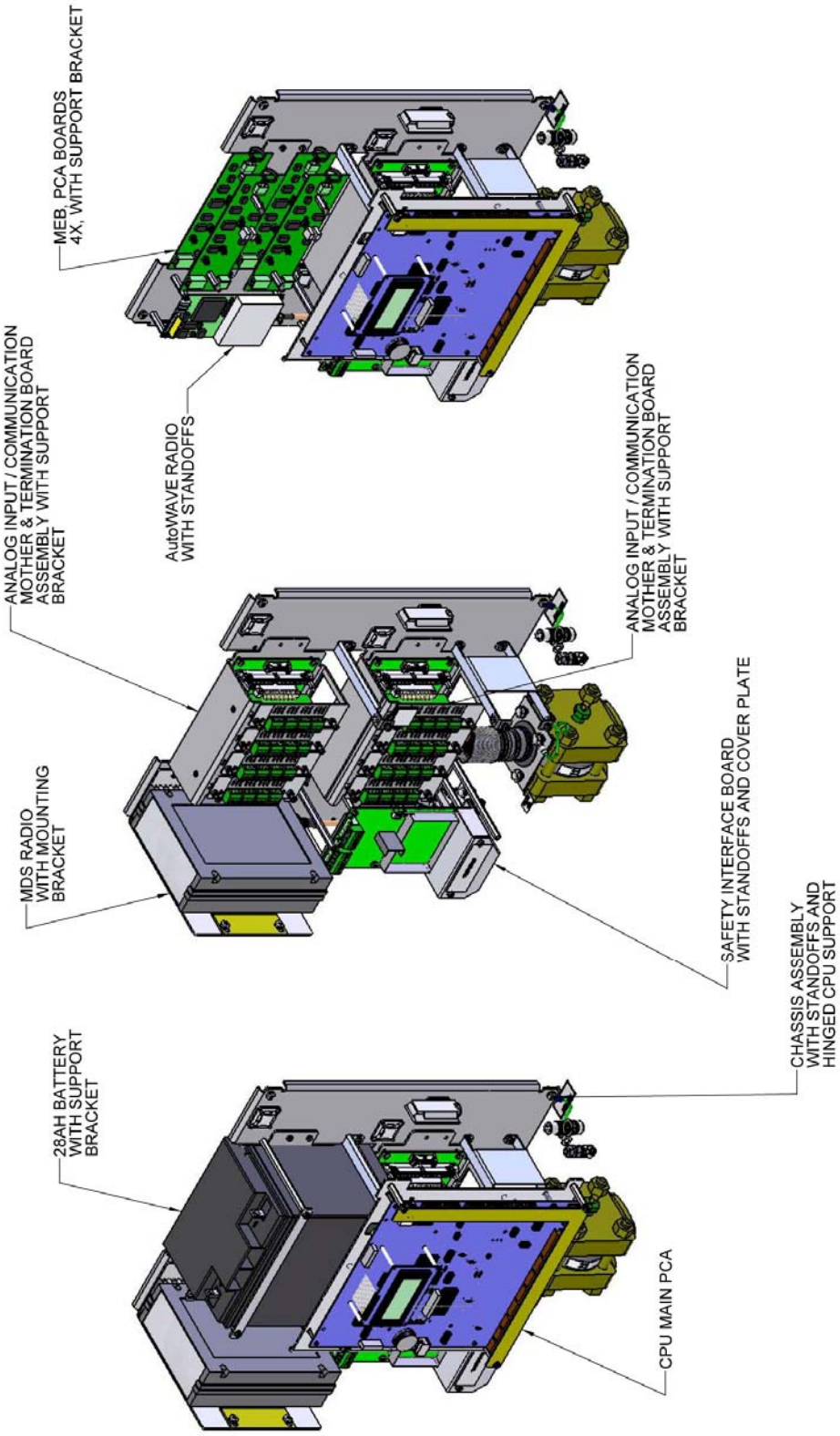


Figure D–3. 0-0500-114: AutoPILOT PRO flow computer general assembly drawing, CSA (sheet 3 of 4)

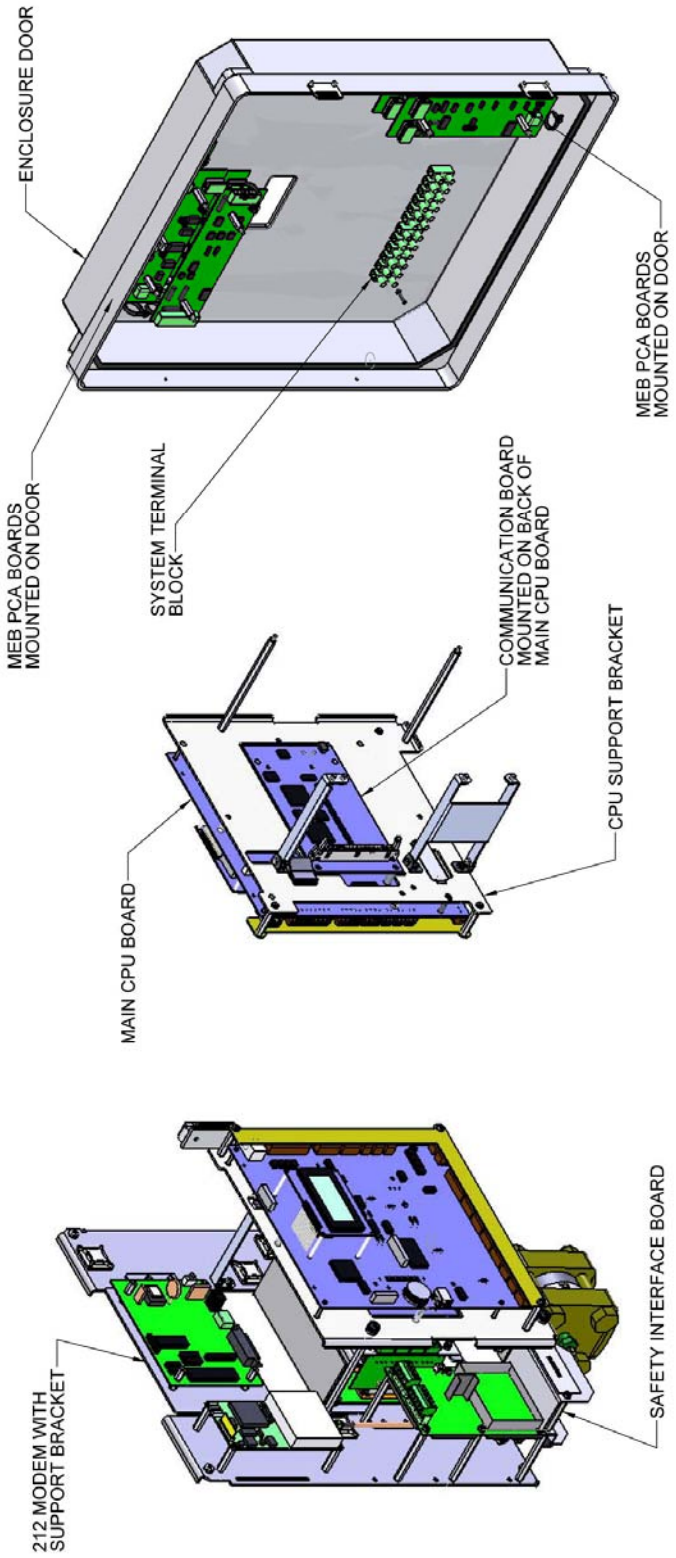

ENCLOSURE DOOR
MEB PCA BOARDS MOUNTED ON DOOR
SYSTEM TERMINAL BLOCK
MEB PCA BOARDS MOUNTED ON DOOR
COMMUNICATION BOARD MOUNTED ON BACK OF MAIN CPU BOARD
CPU SUPPORT BRACKET
MAIN CPU BOARD
212 MODEM WITH SUPPORT BRACKET
SAFETY INTERFACE BOARD

Figure D–4. 0-0500-114: AutoPILOT PRO flow computer general assembly drawing, CSA (sheet 4 of 4)

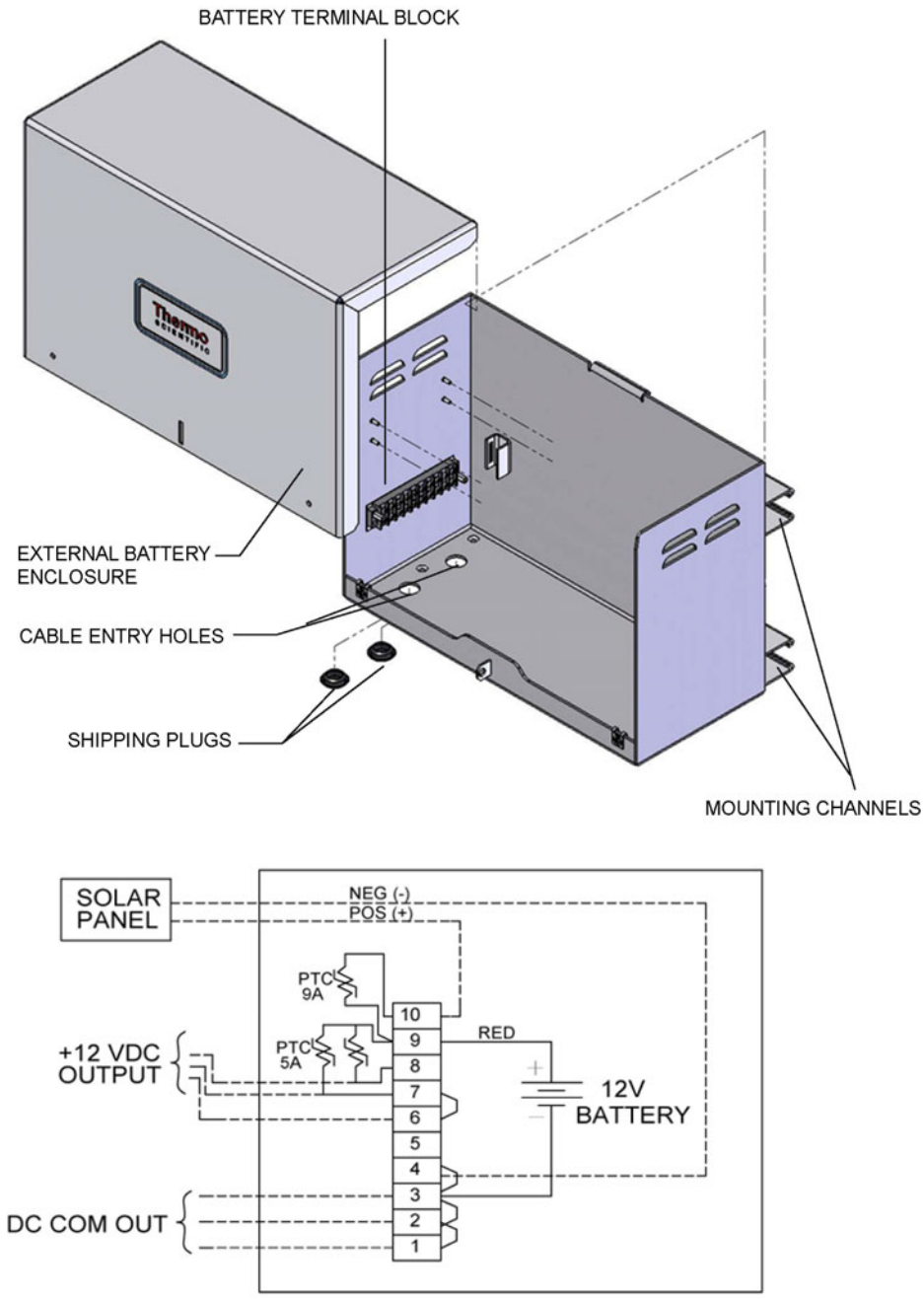


Figure D–5. 8-0500-082: External battery system assembly drawing (sheet 1 of 1)

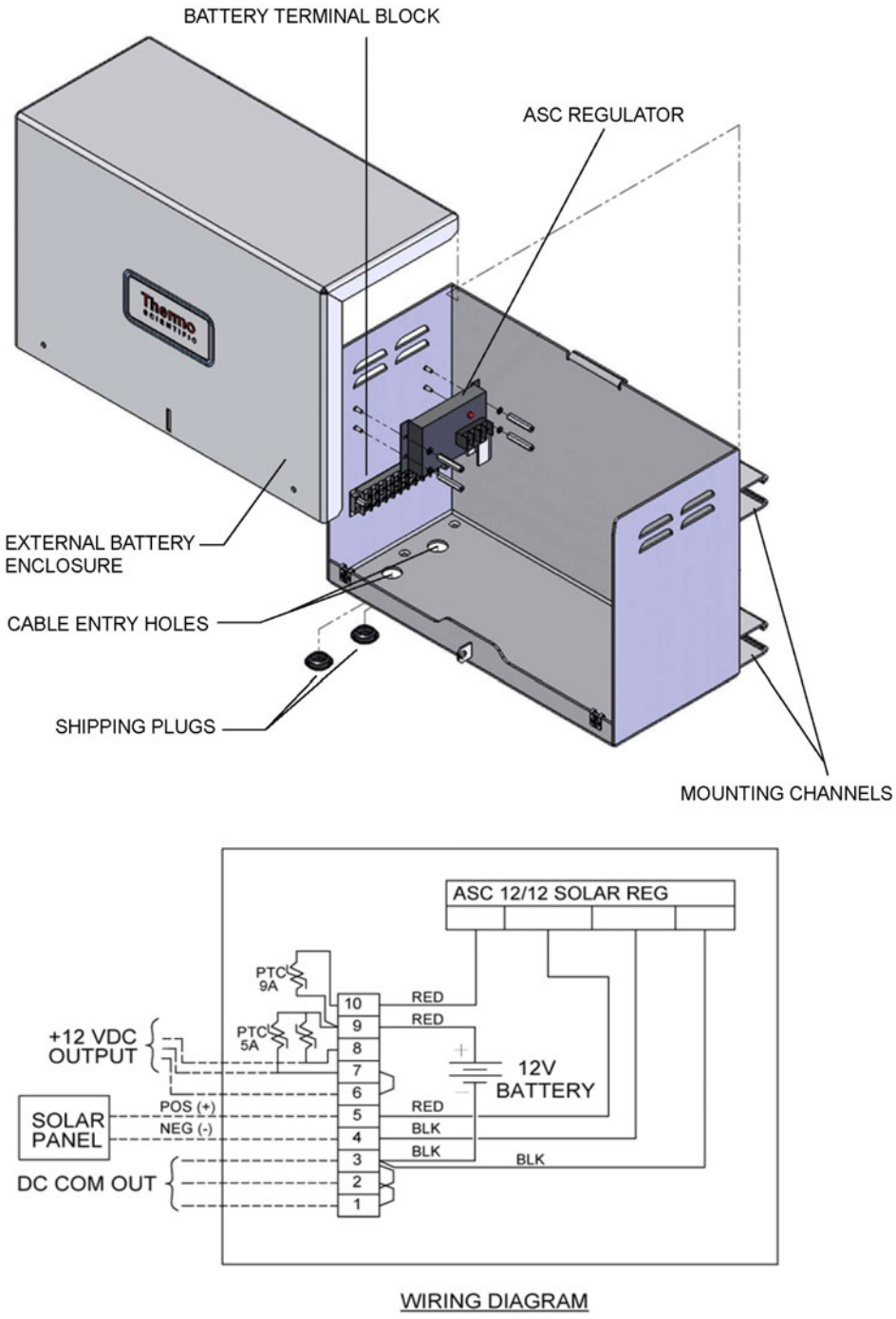


Figure D–6. 8-0500-083: External battery system with ASC regulator assembly drawing (sheet 1 of 1)

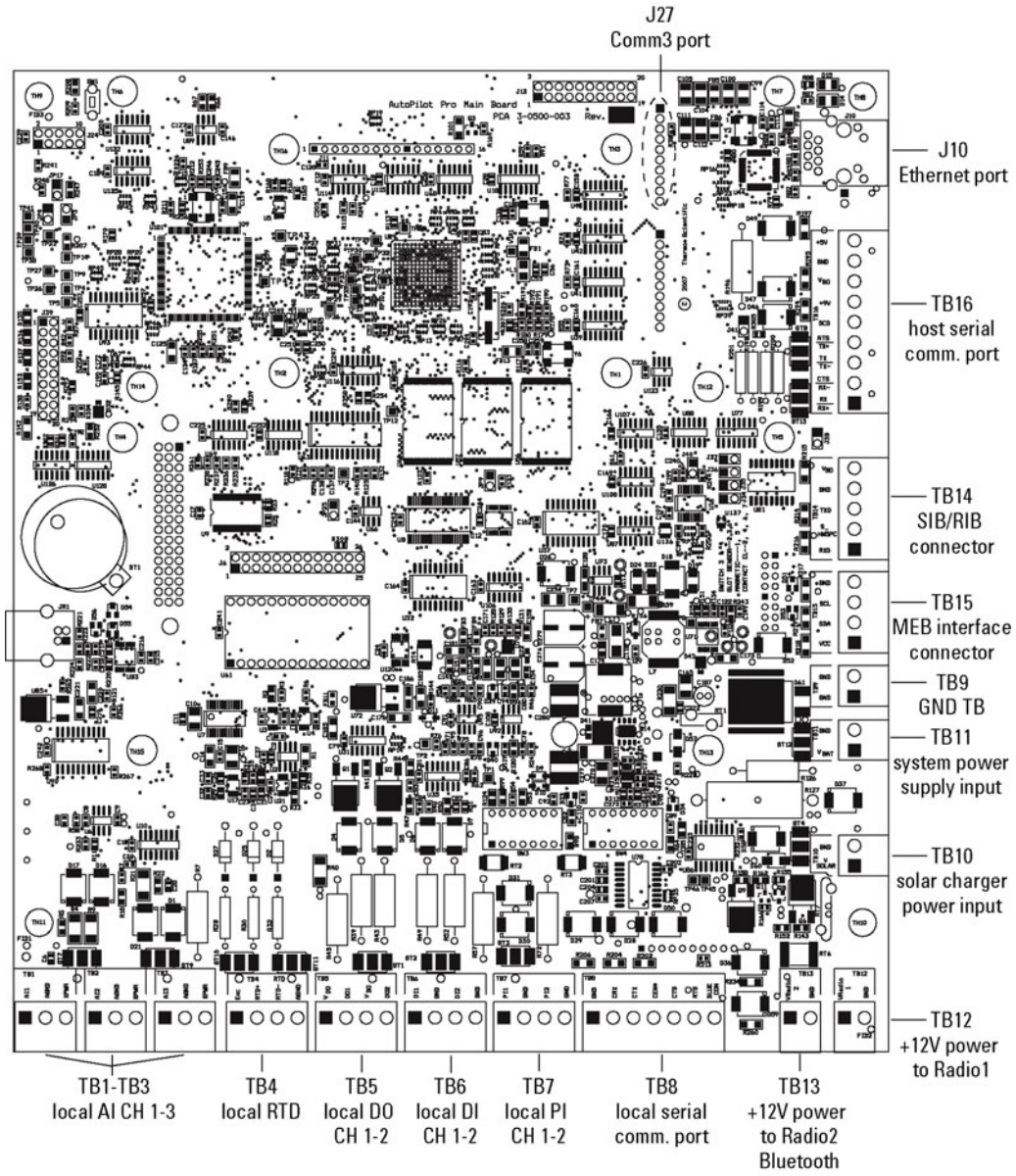


Figure D–7. 4-0500-003: AutoPILOT PRO main board connectors (component side) (sheet 1 of 2)

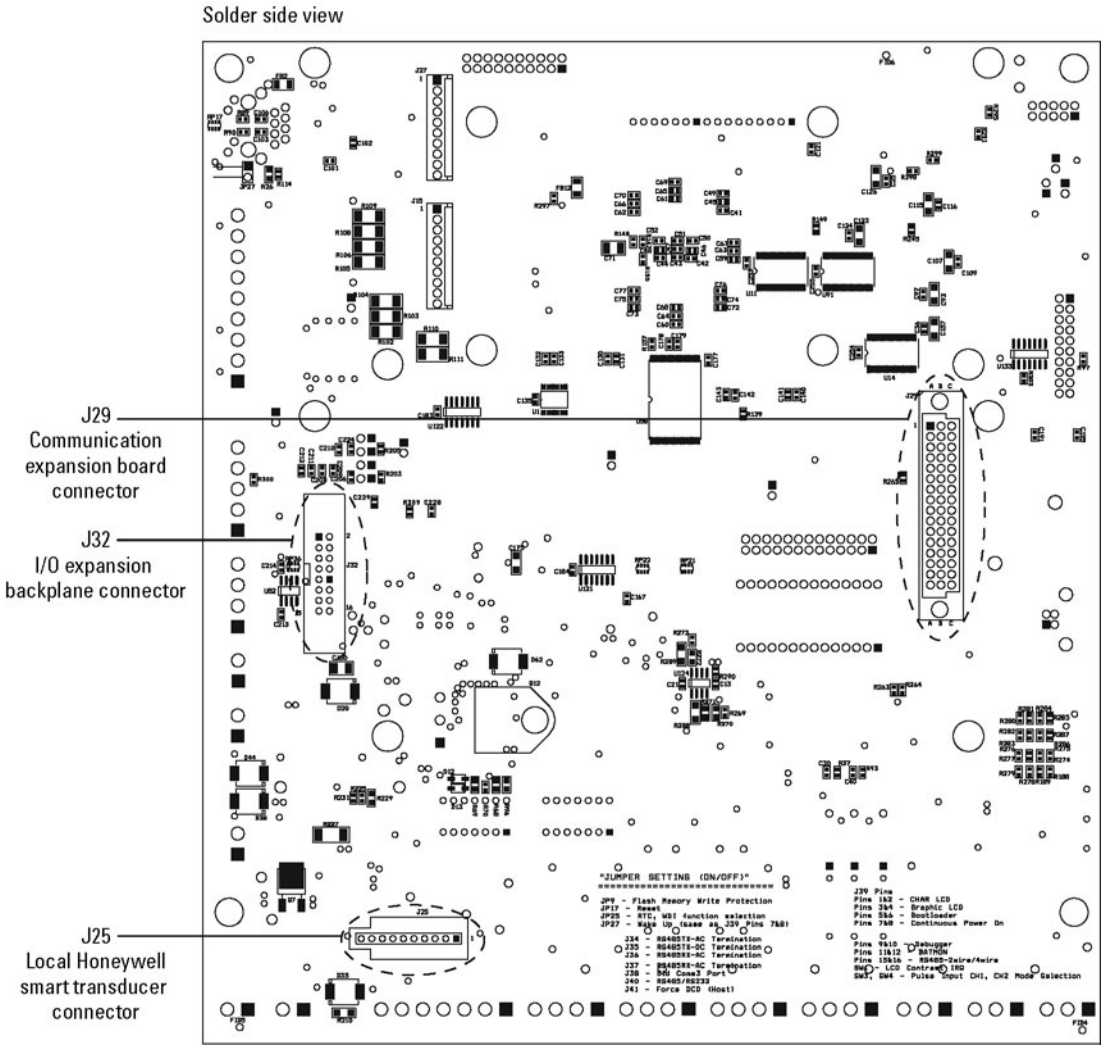


Figure D–8. AutoPILOT PRO main board connectors (solder side) (sheet 2 of 2)

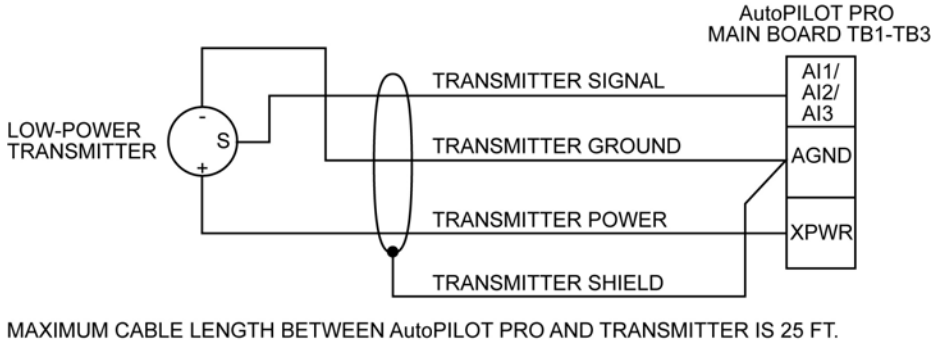


Figure D–9. TB1–TB3: Typical analog input wiring for low power transmitter

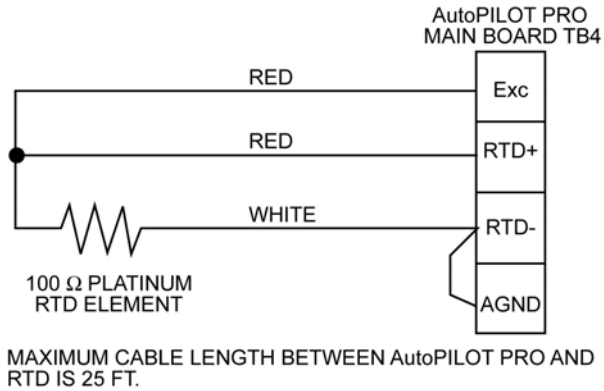


Figure D–10. TB4: Typical RTD wiring

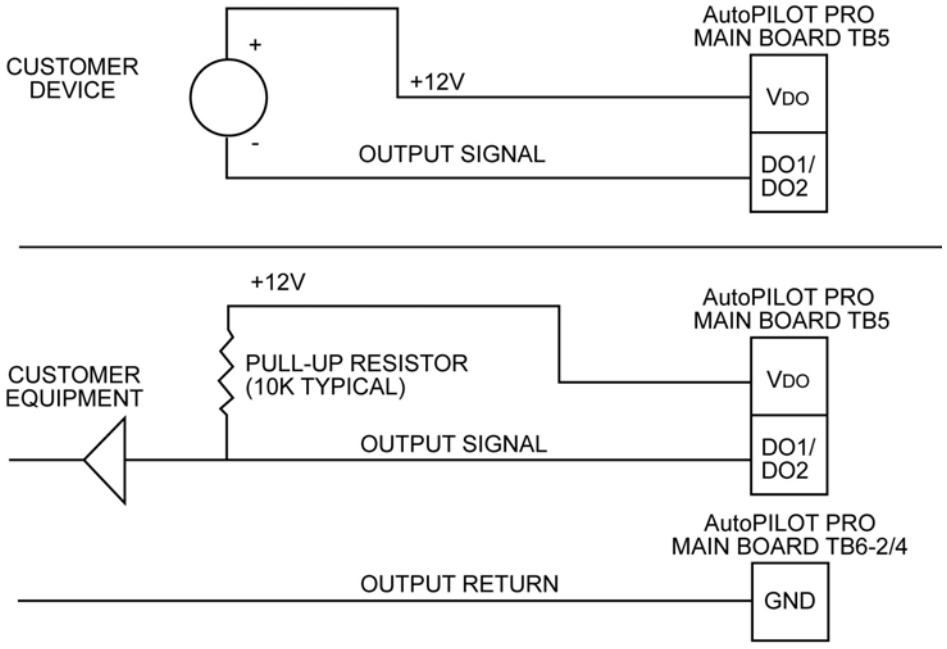


Figure D–11. TB5: Typical discrete output wiring

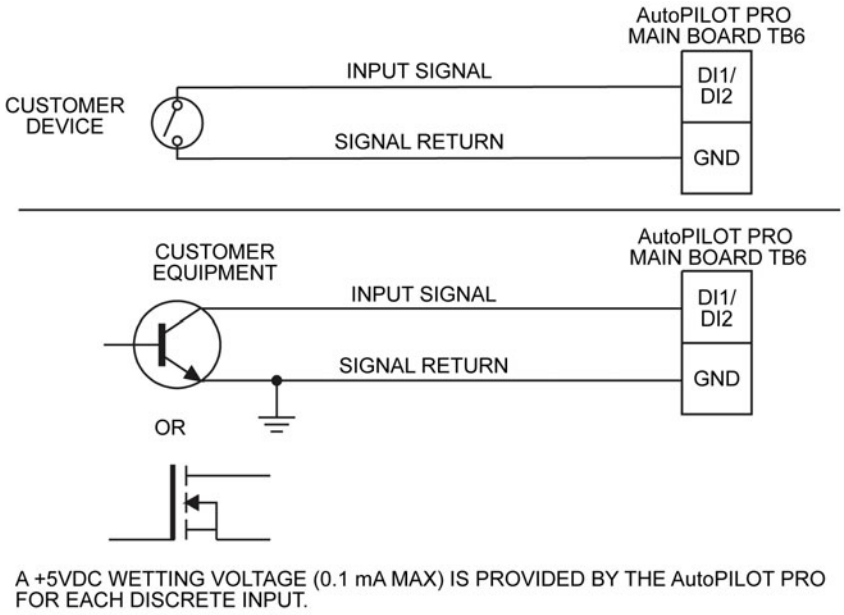


Figure D–12. TB6: Typical discrete input wiring

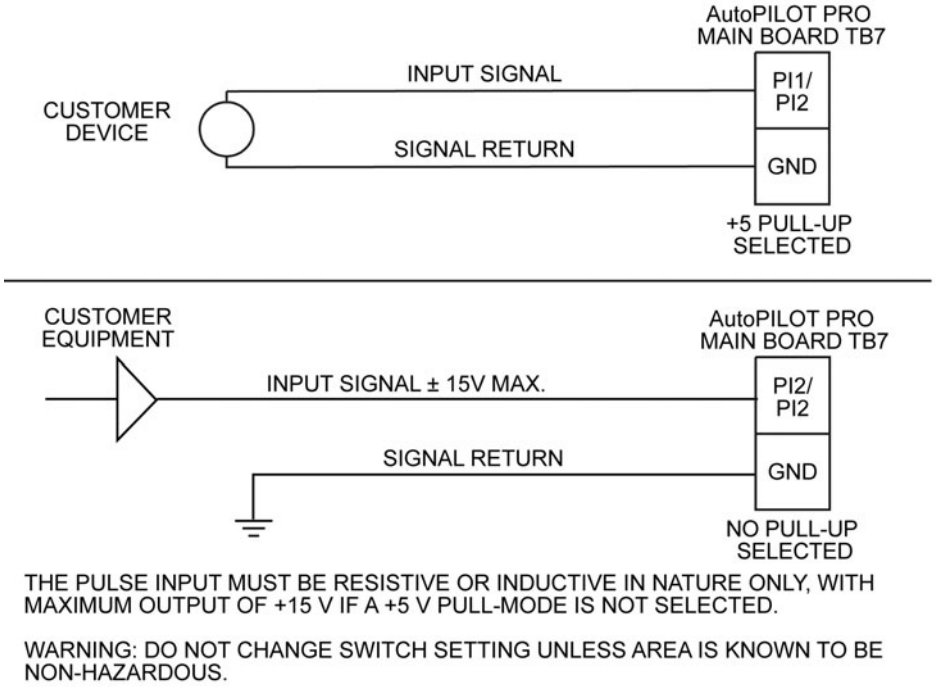


Figure D–13. TB7: Typical pulse input wiring

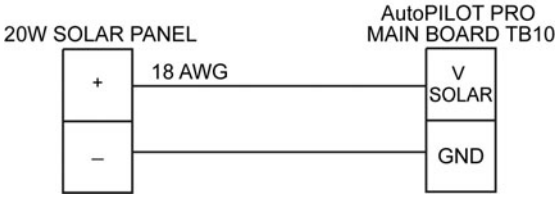


Figure D–14. TB10: Solar panel wiring for internal battery option

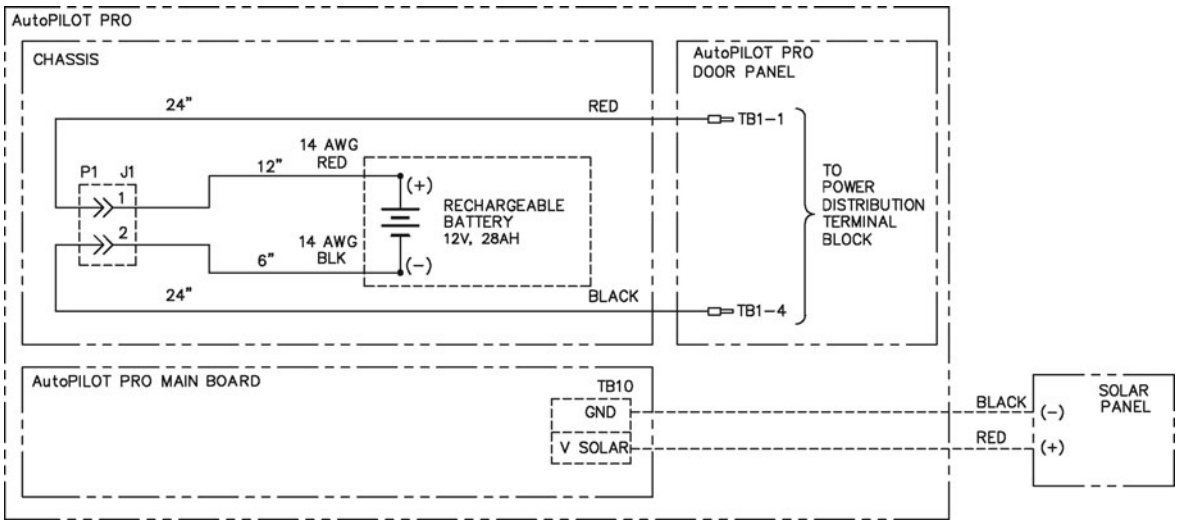


Figure D–15. 3-0500-017: Internal battery wiring diagram

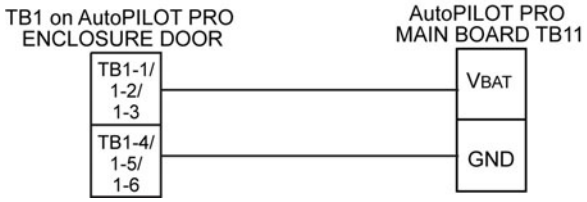


Figure D–16. TB11: System power supply input to power distribution terminal block

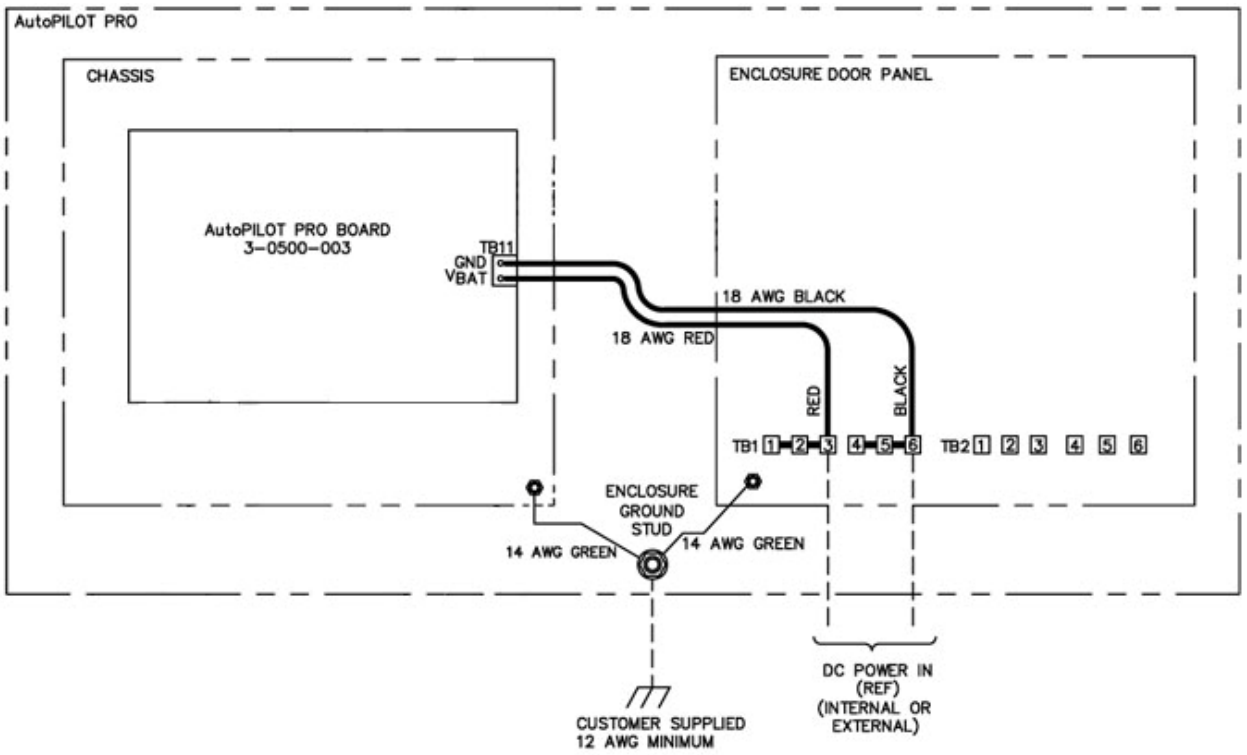
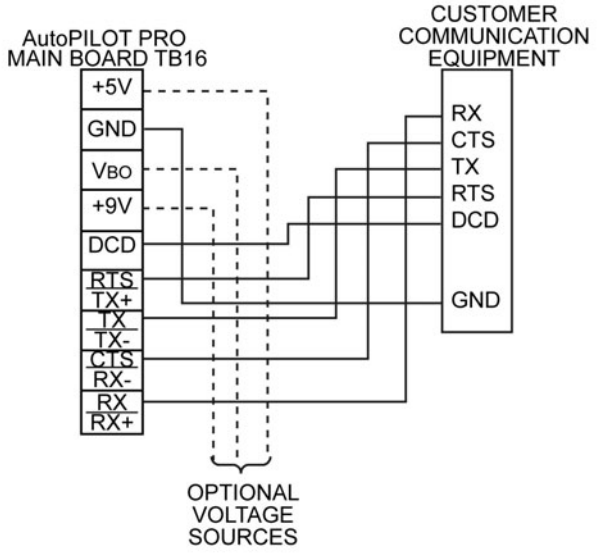


Figure D–17. 0-0500-106: Basic system wiring diagram



CUSTOMER EQUIPMENT AND DEVICES MUST BE SUITABLE FOR THE LOCATION IN WHICH THEY ARE TO BE INSTALLED.

DO NOT EXCEED +15 VDC ON ANY OF THE COMMUNICATION LINES.

FOR RS232 MODE, DO NOT INSTALL JUMPER J40.
FOR RS232 MODE WITHOUT DCD SIGNAL, INSTALL JUMPER J41.

IF REQUIRED, AutoPILOT PRO CAN PROVIDE WETTING VOLTAGE SOURCES TO COMMUNICATION PORT:

AUXILIARY +9 (TB16-6): +9 VDC NOMINAL, 5 mA MAX LOAD
AUXILIARY VBO (TB16-7): +12 VDC NOMINAL, 10 mA MAX LOAD
AUXILIARY +5 (TB16-9): +5 VDC NOMINAL, 5 mA MAX LOAD

FOR RS485 MODE, INSTALL JUMPERS J40 AND J41.

Figure D–18. TB16: Host serial communication port

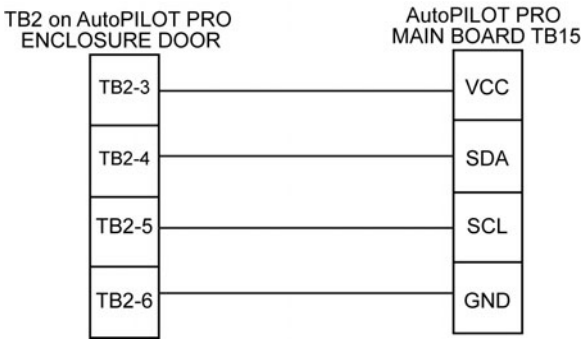


Figure D–19. TB15: MEB interface connector to MEB terminal block

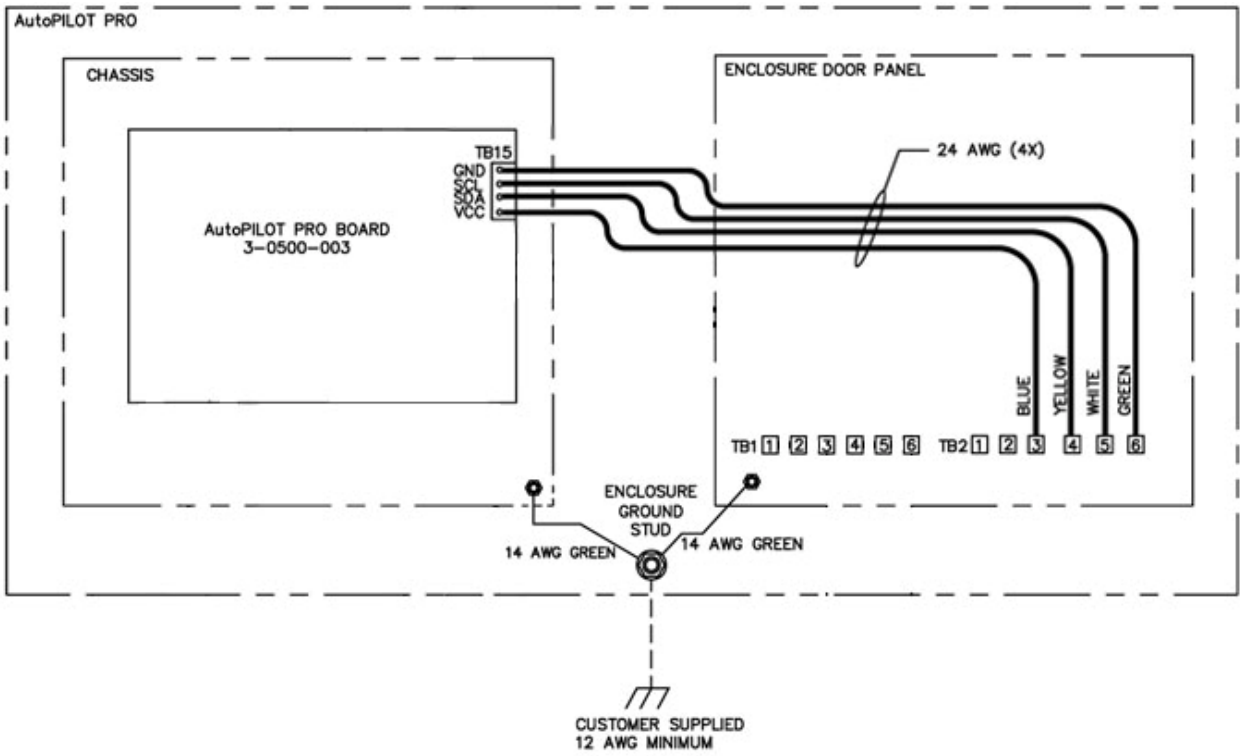


Figure D–20. 0-0500-106: Wiring diagram for MEB interface connector (main board TB15)

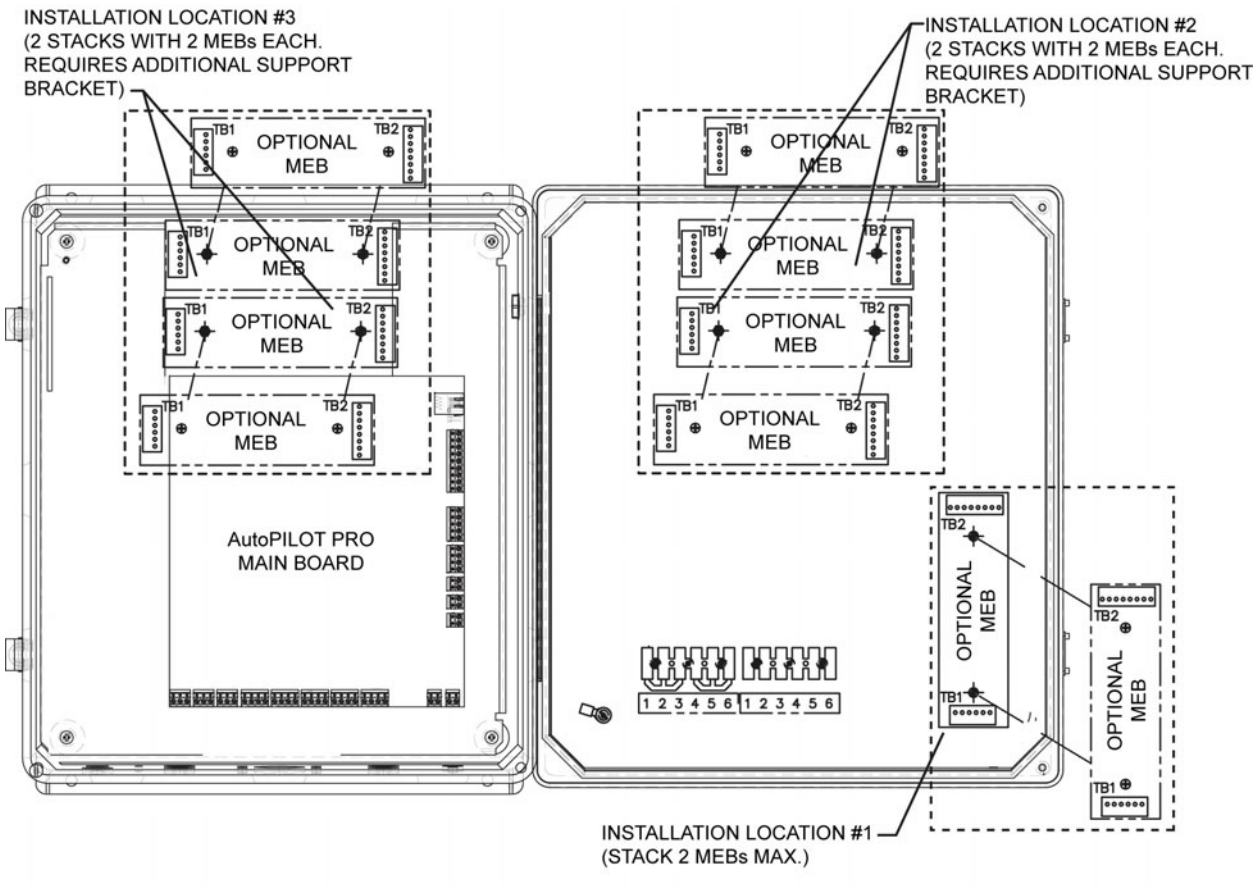


Figure D–21. MEB installation locations

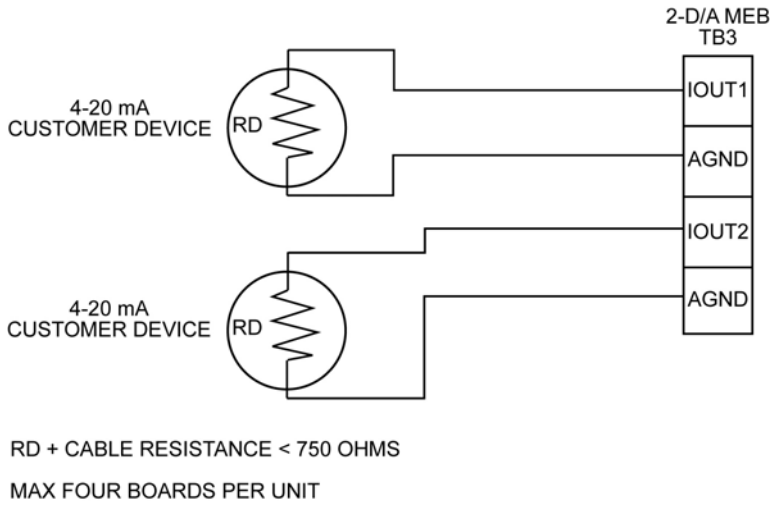


Figure D–22. Typical output connections to 2-D/A MEB

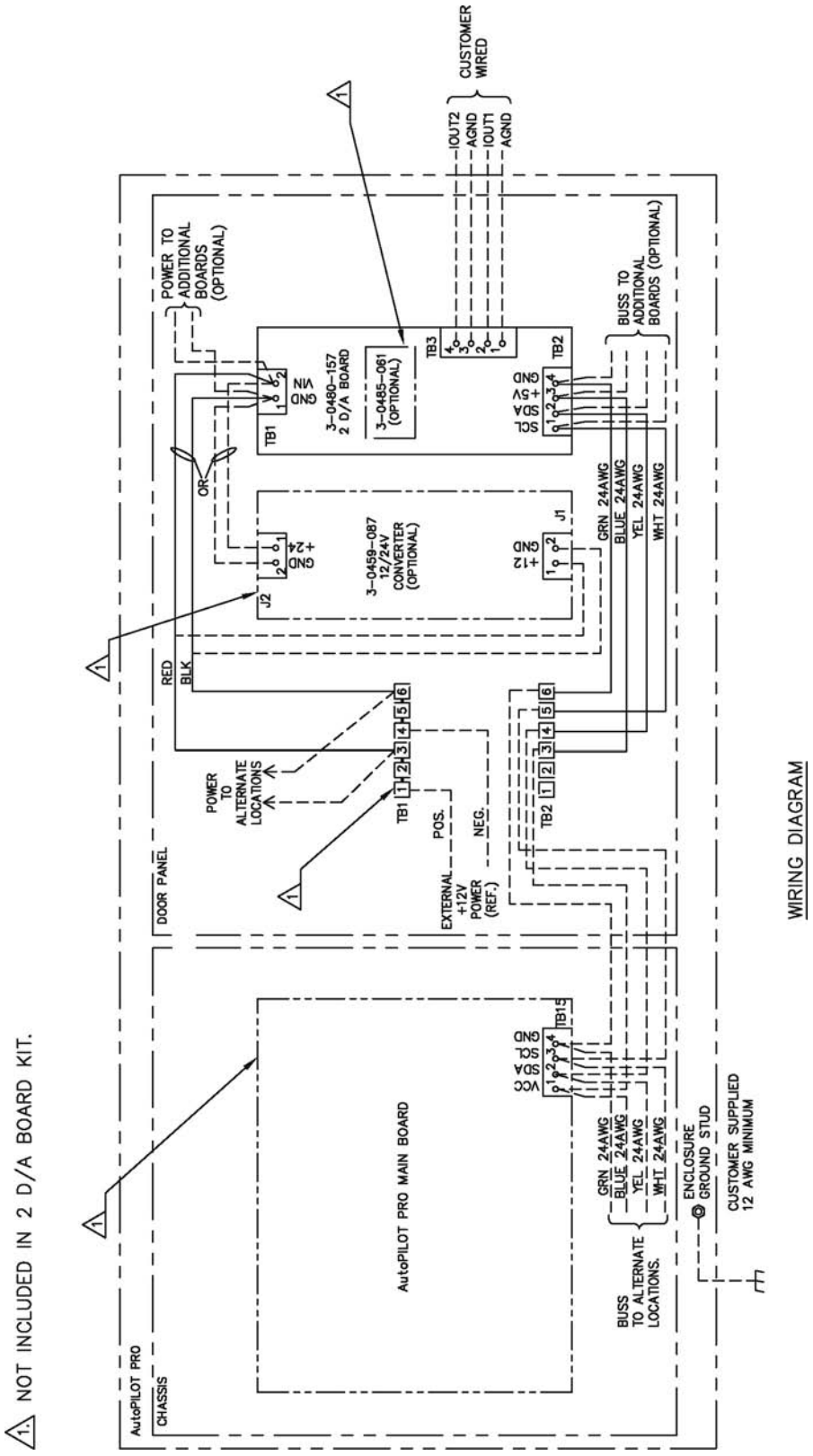
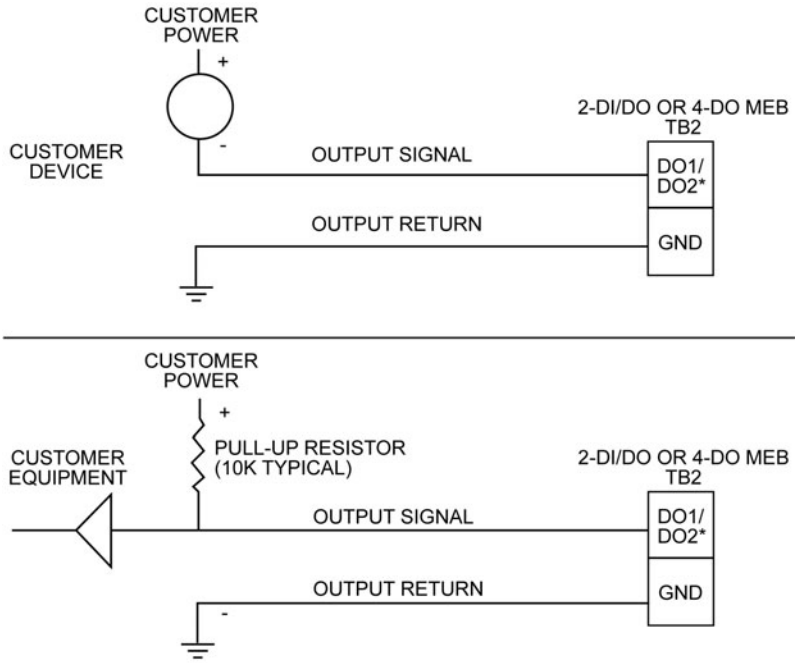


Figure D–23. 3-0500-065: 2-D/A MEB wiring diagram, Div. 2



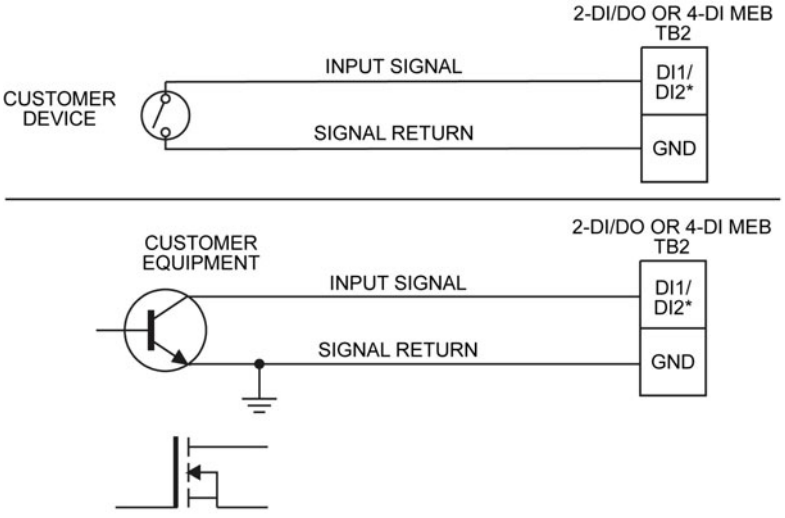
*DO3 AND DO4 ALSO AVAILABLE FOR 4-DO MEB.

CUSTOMER DISCRETE OUTPUT MUST NOT EXCEED 30 VDC OR 250 mA. RESISTIVE CIRCUIT (C = ø µf, L = ø mH).

MAX SIX 2-DI/DO MEBs PER UNIT.

MAX FOUR 4-DO MEBs PER UNIT.

Figure D–24. Typical discrete output wiring for 2-DI/DO or 4-DO MEB



*DI3 and DI4 ALSO AVAILABLE FOR 4-DI MEB.

A +5VDC WETTING VOLTAGE (0.1 mA MAX) IS PROVIDED BY THE MEB FOR EACH DISCRETE INPUT.

MAX SIX 2-DI/DO MEBs PER UNIT.

MAX FOUR 4-DI MEBs PER UNIT.

Figure D–25. Typical discrete input wiring for 2-DI/DO or 4-DI MEB

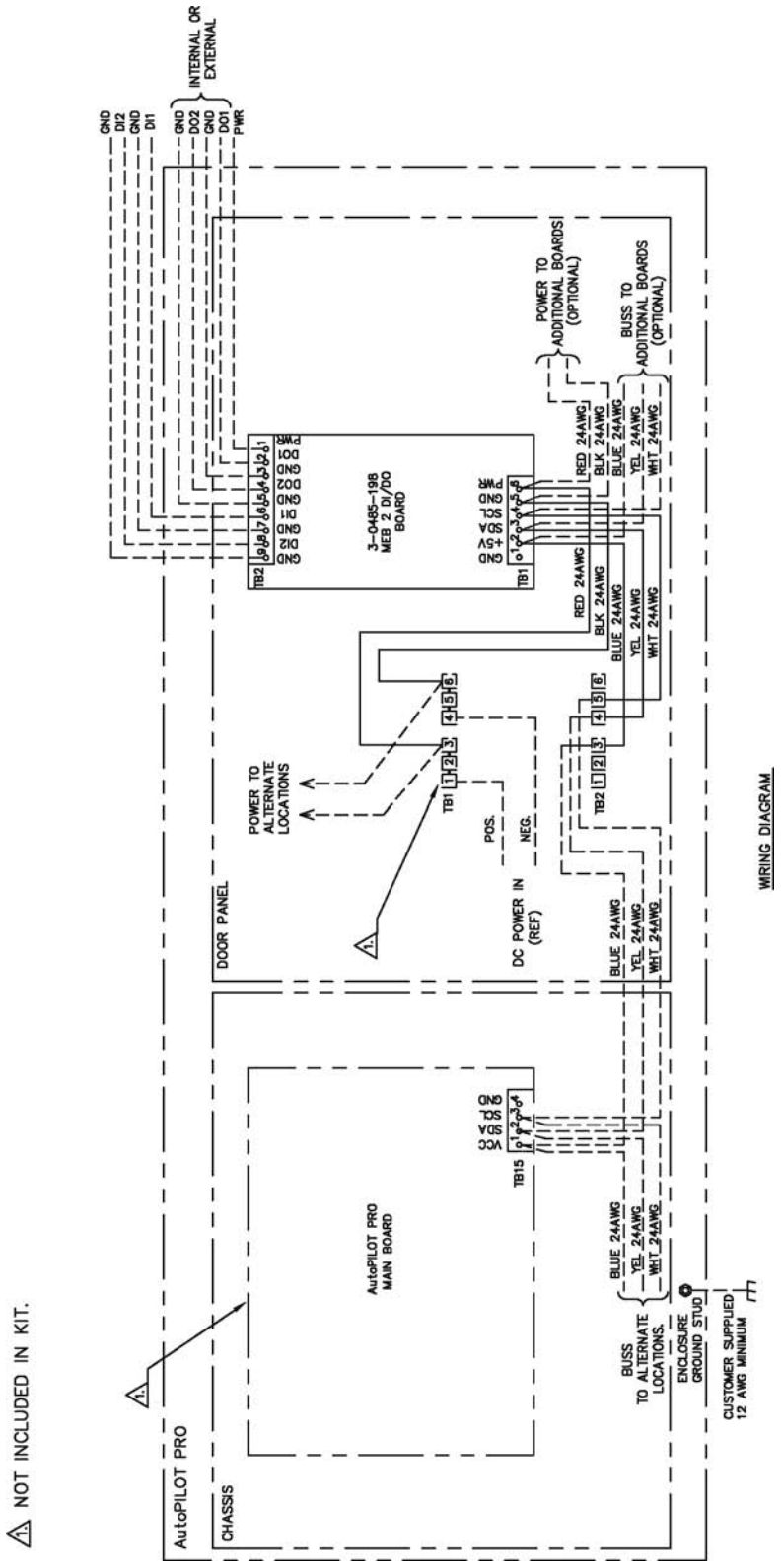


Figure D–26. 3-0500-066: 2-DI/DO wiring diagram

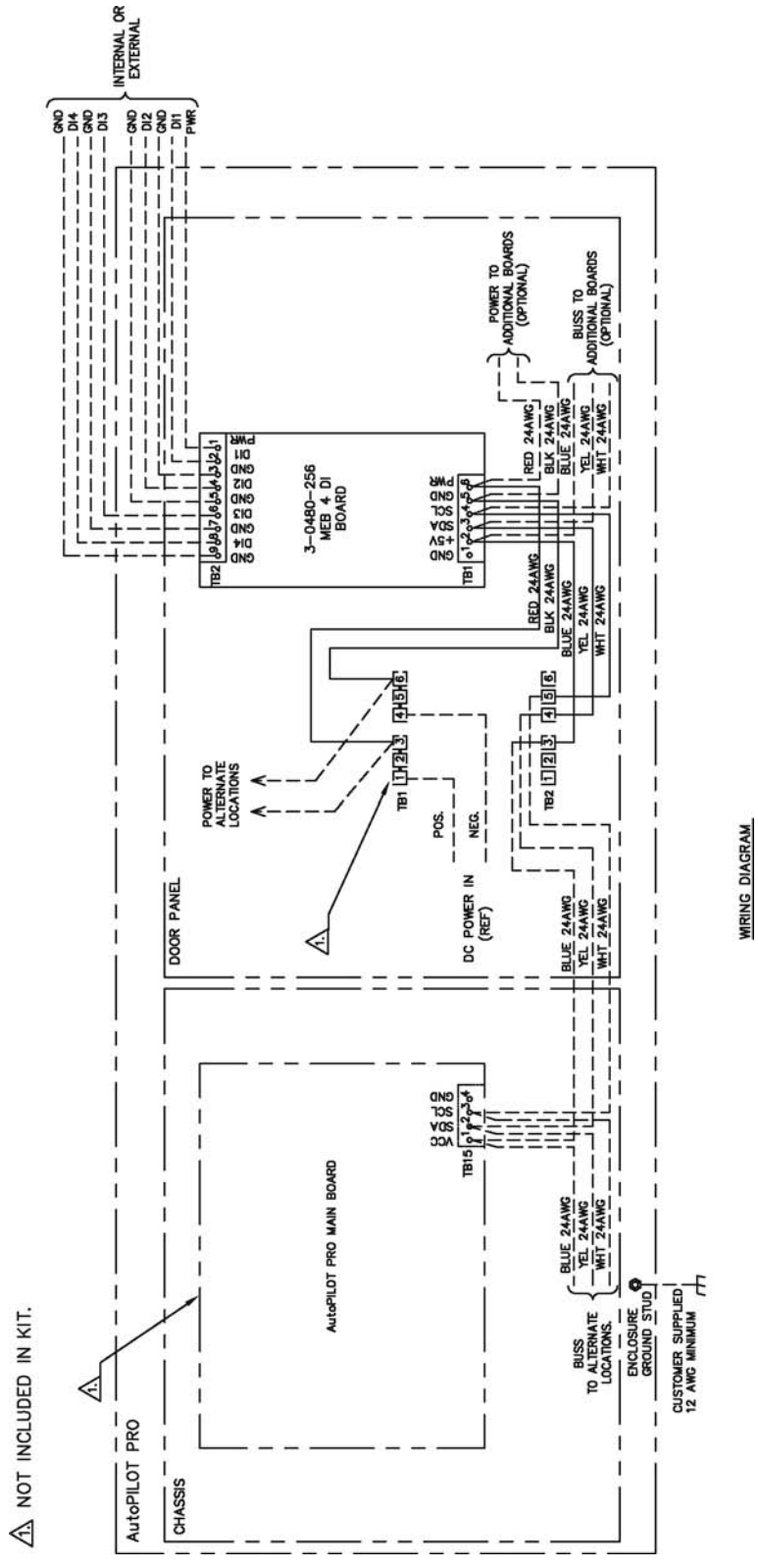


Figure D–27. 3-0500-067: 4-DI MEB wiring diagram

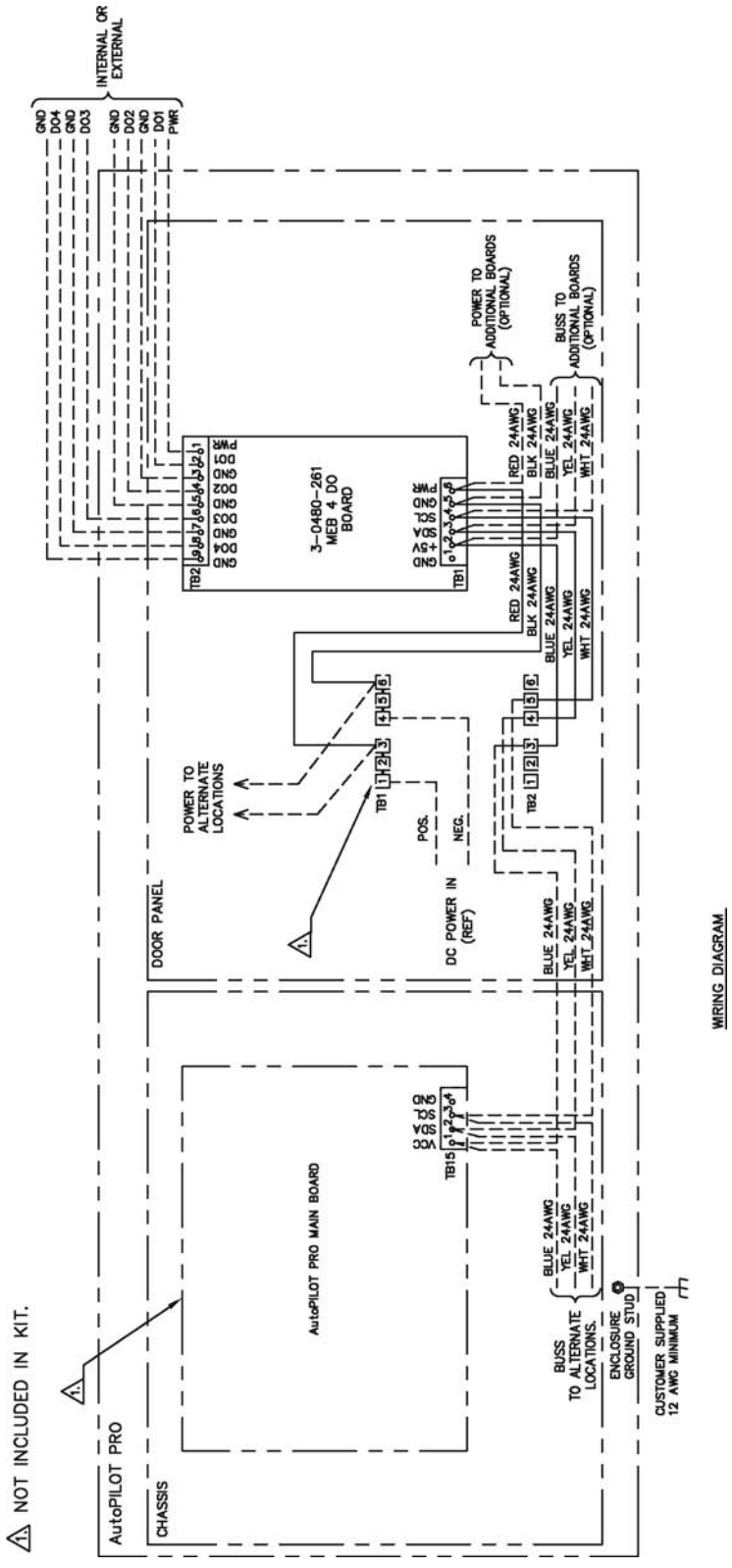


Figure D–28. 3-0500-068: 4-DO MEB wiring diagram

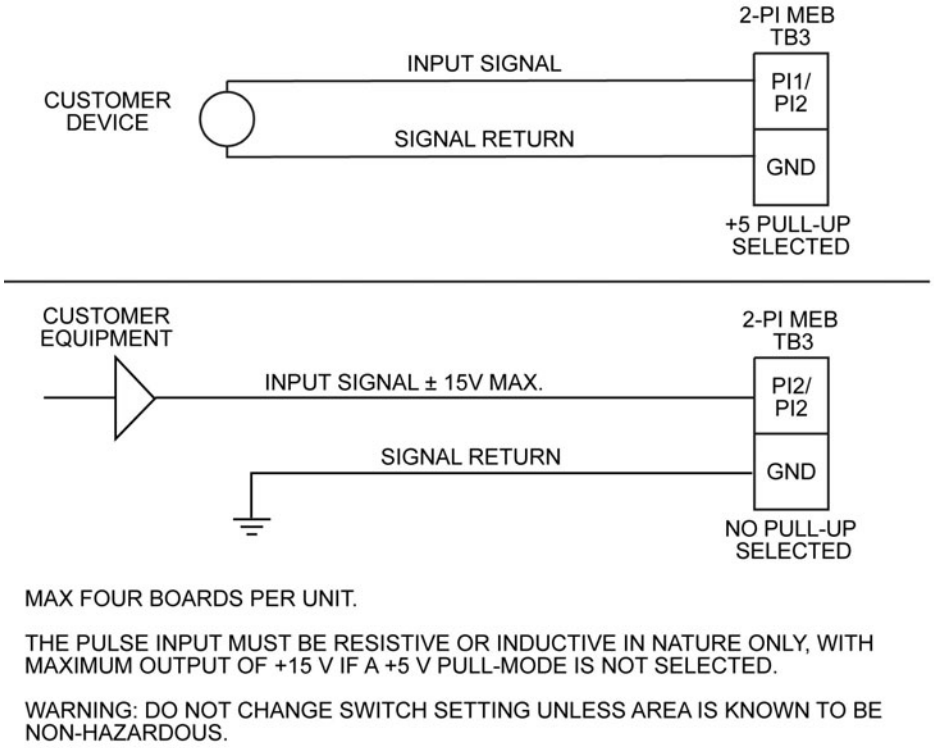


Figure D–29. Typical pulse input wiring for 2-PI MEB

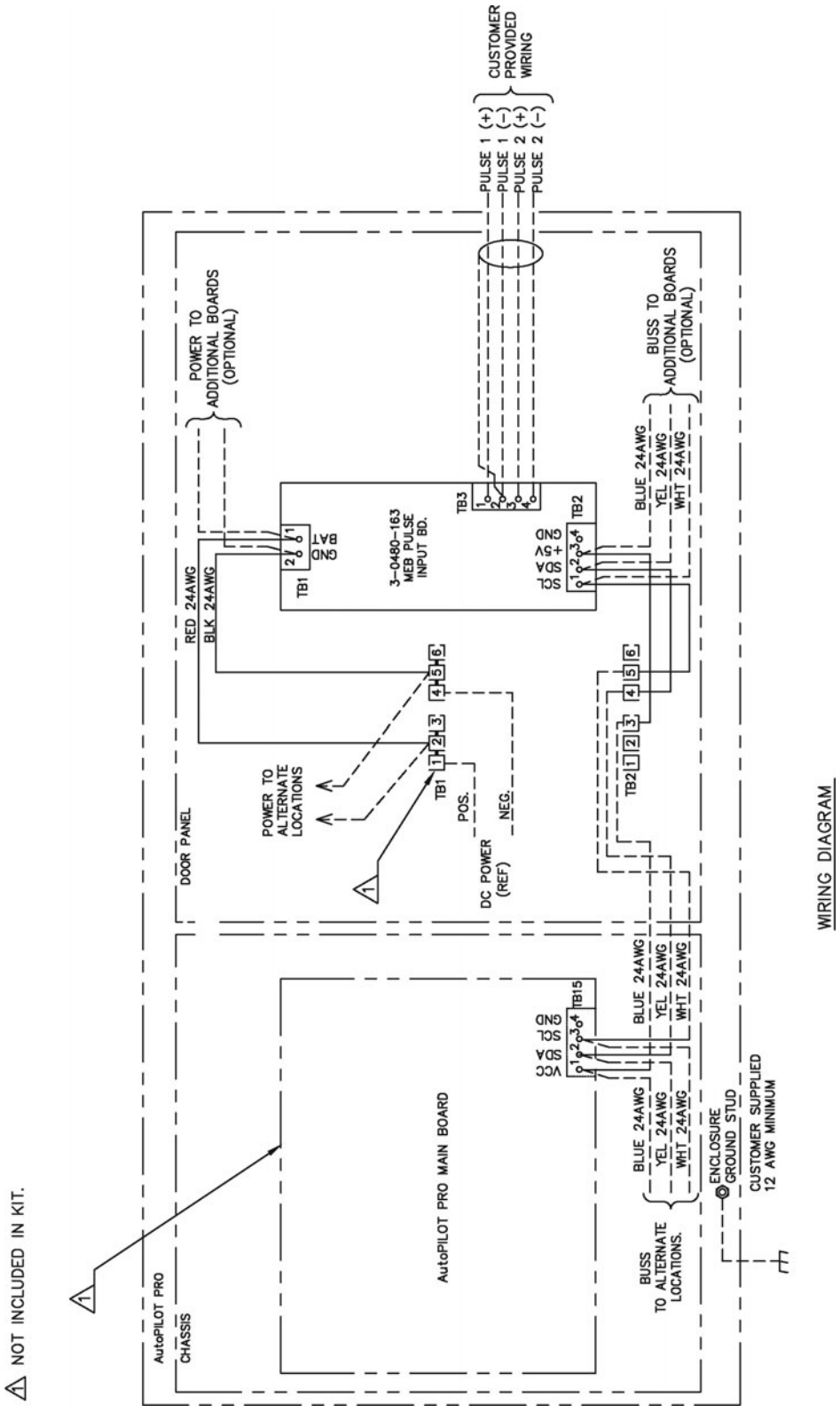


Figure D–30. 3-0500-069: 2-PI MEB wiring diagram

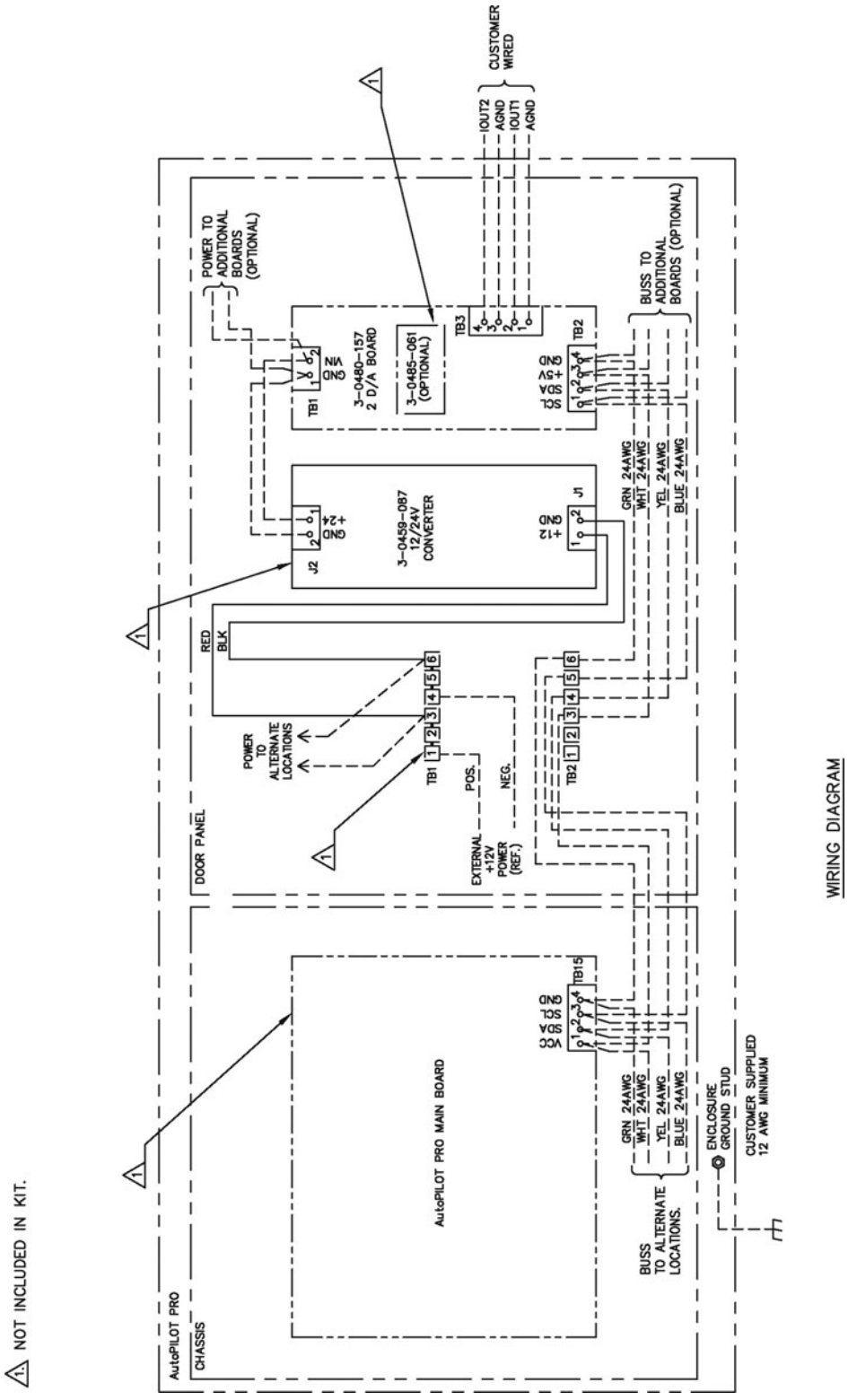


Figure D–31. 3-0500-080: 12/24 Vdc converter board wiring diagram

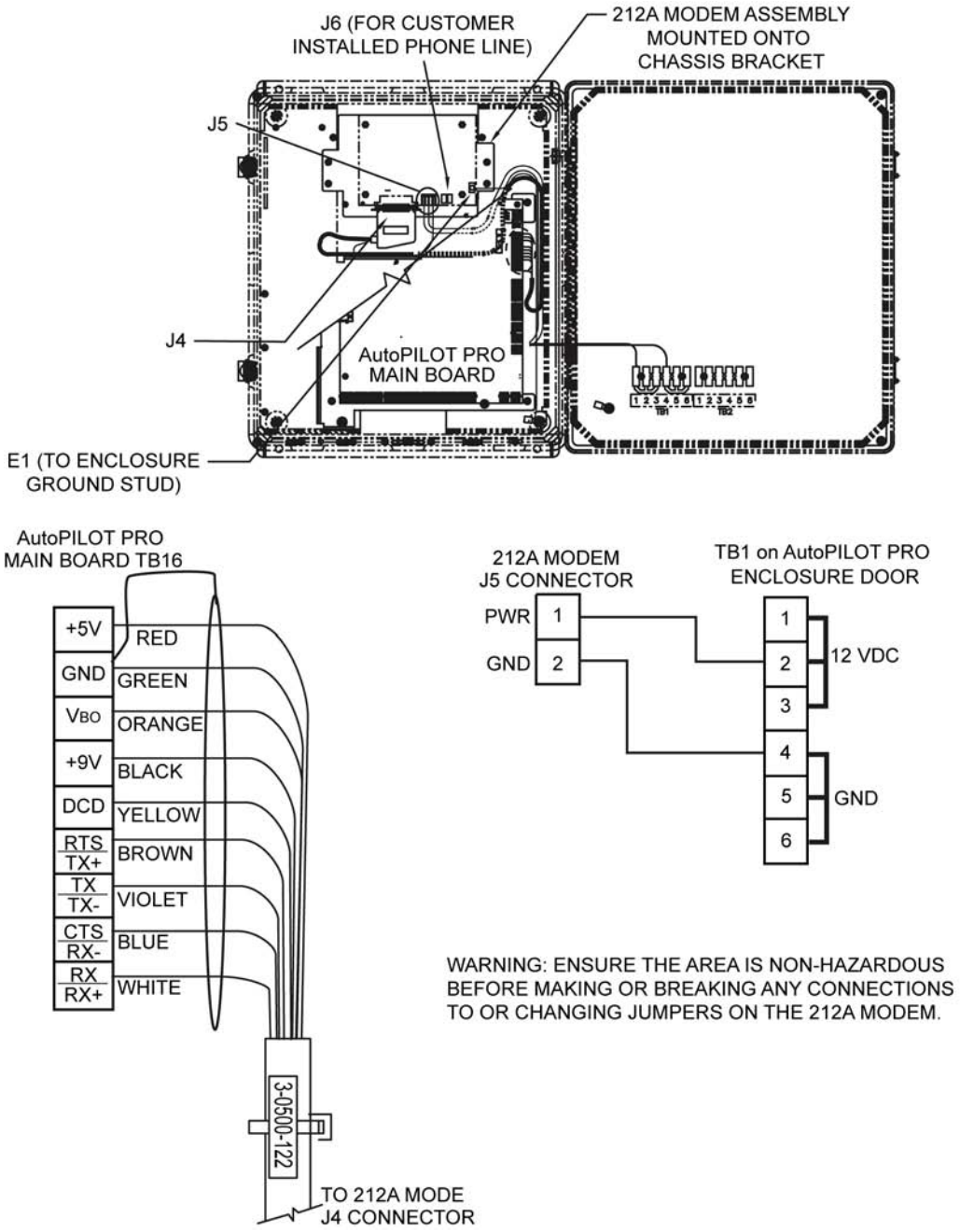


Figure D–32. 212A modem installation and wiring

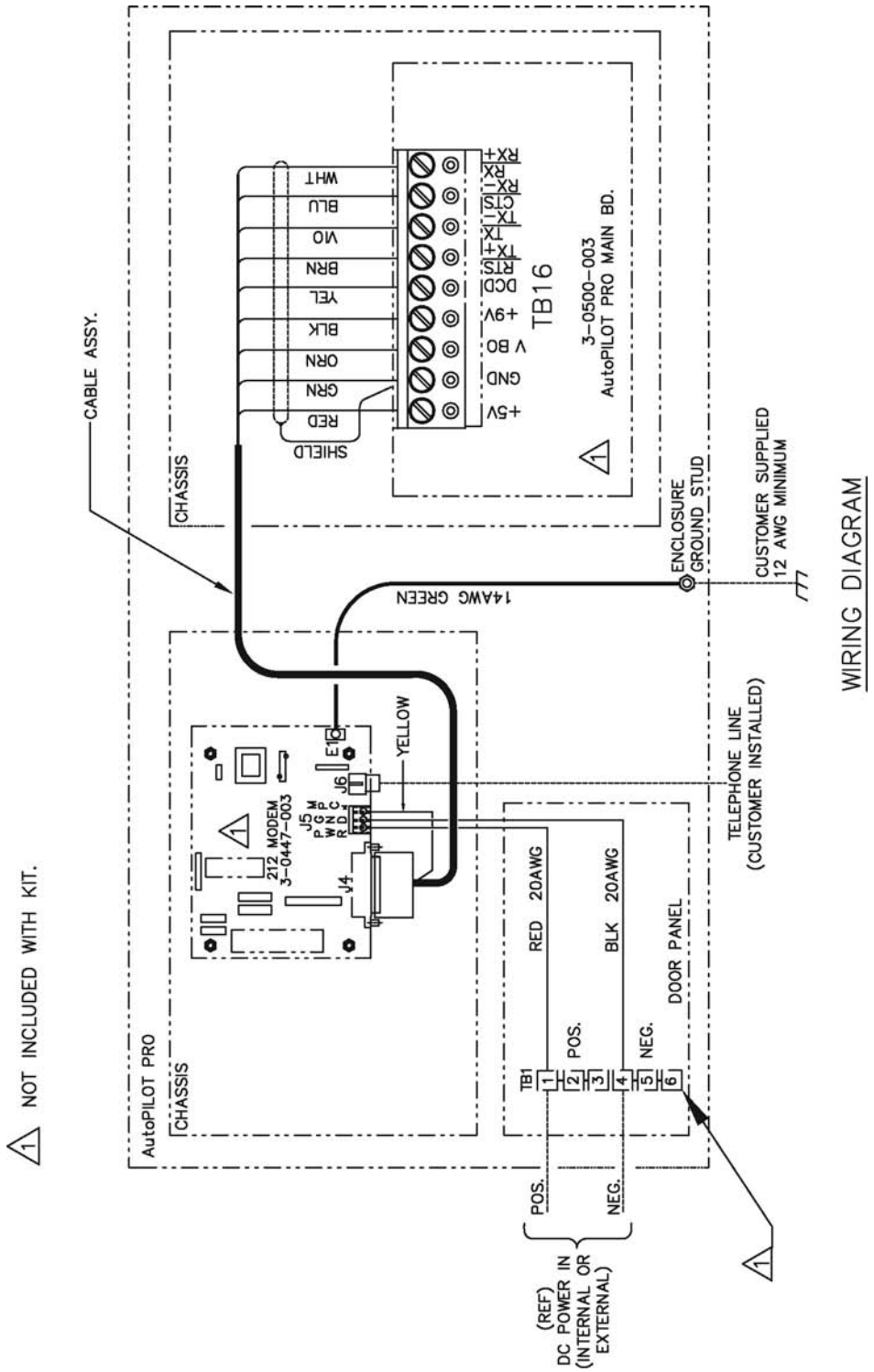


Figure D–33. 3-0500-071: 212A modem ready wiring diagram

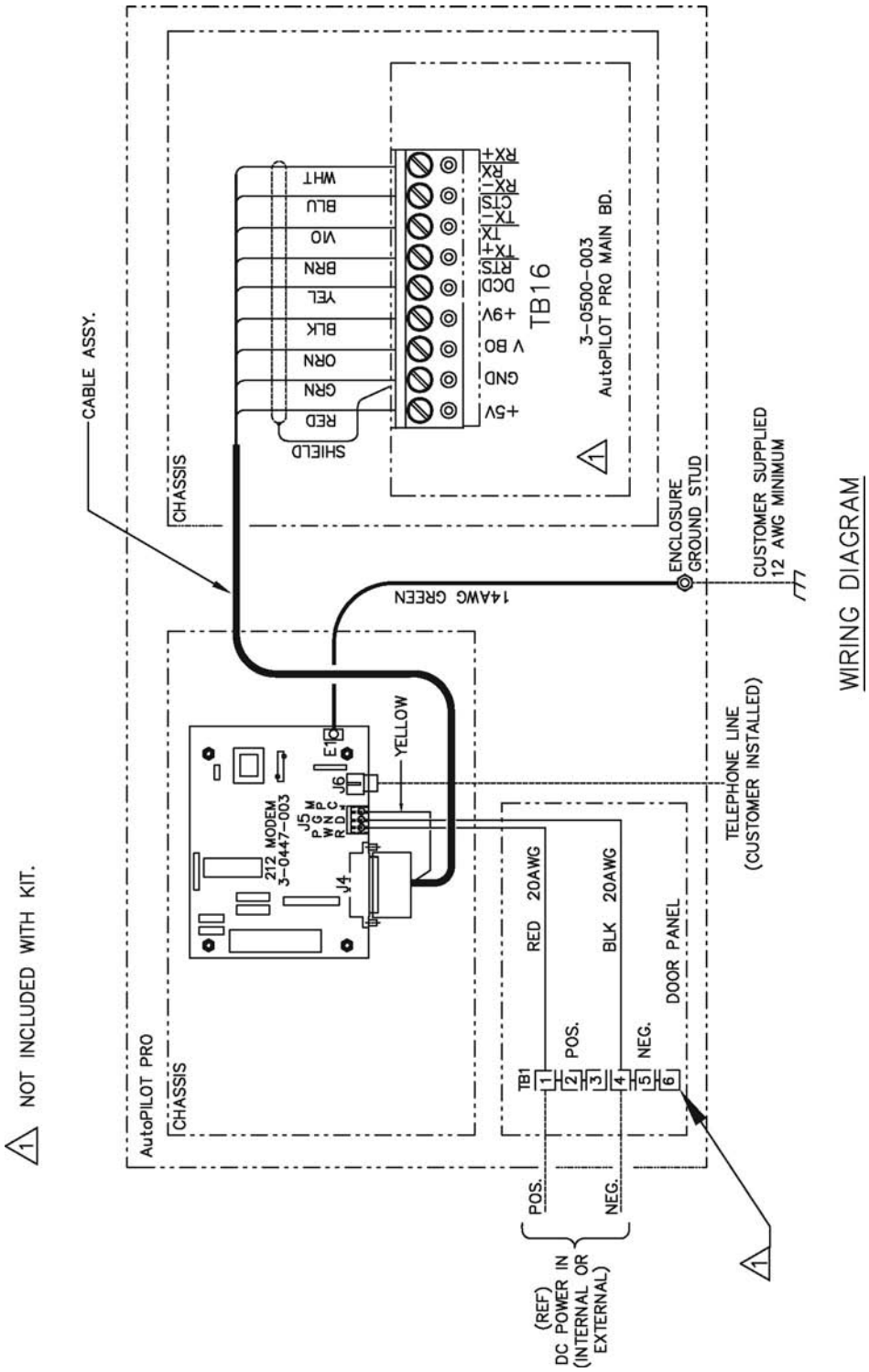


Figure D–34. 3-0500-093: 212A modem wiring diagram

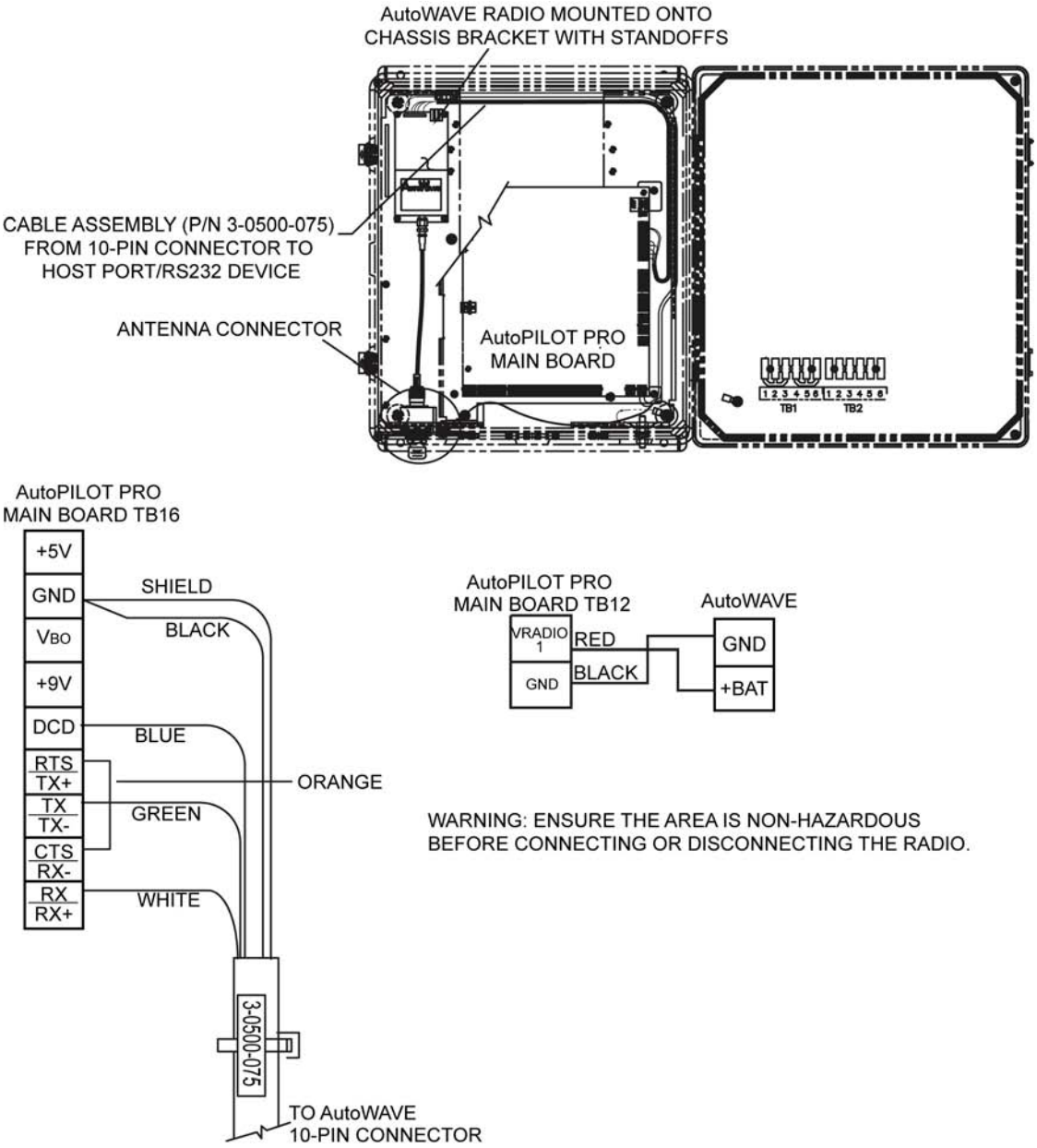


Figure D–35. AutoWAVE radio installation and wiring

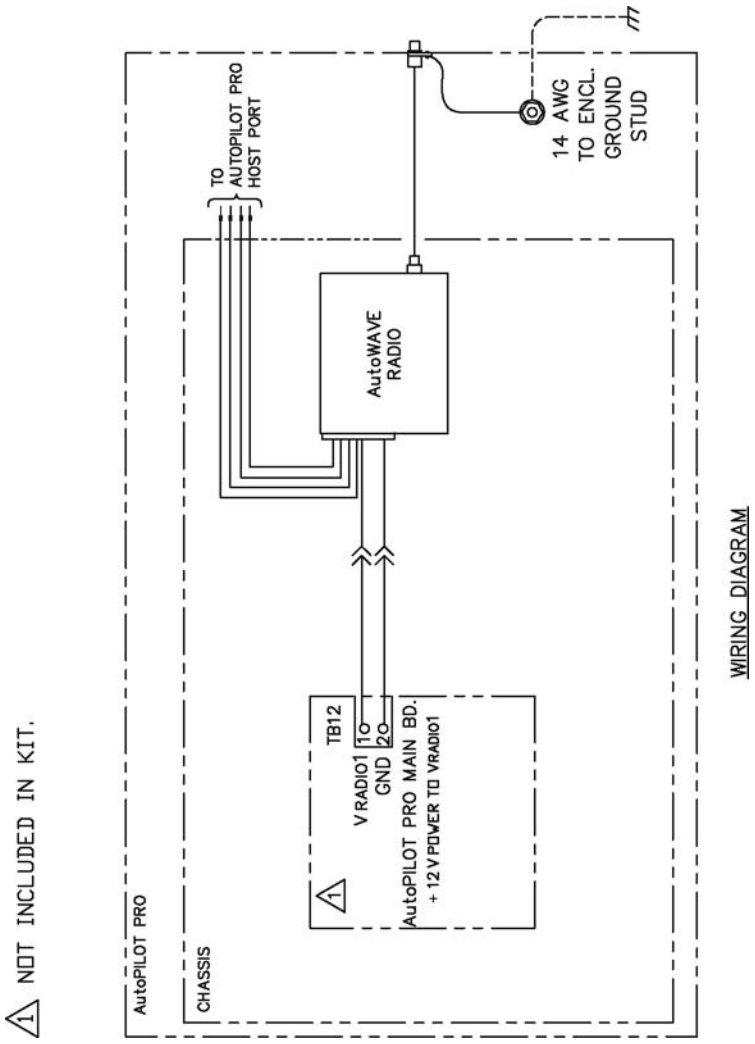


Figure D–36. 3-0500-072: AutoWAVE radio wiring diagram

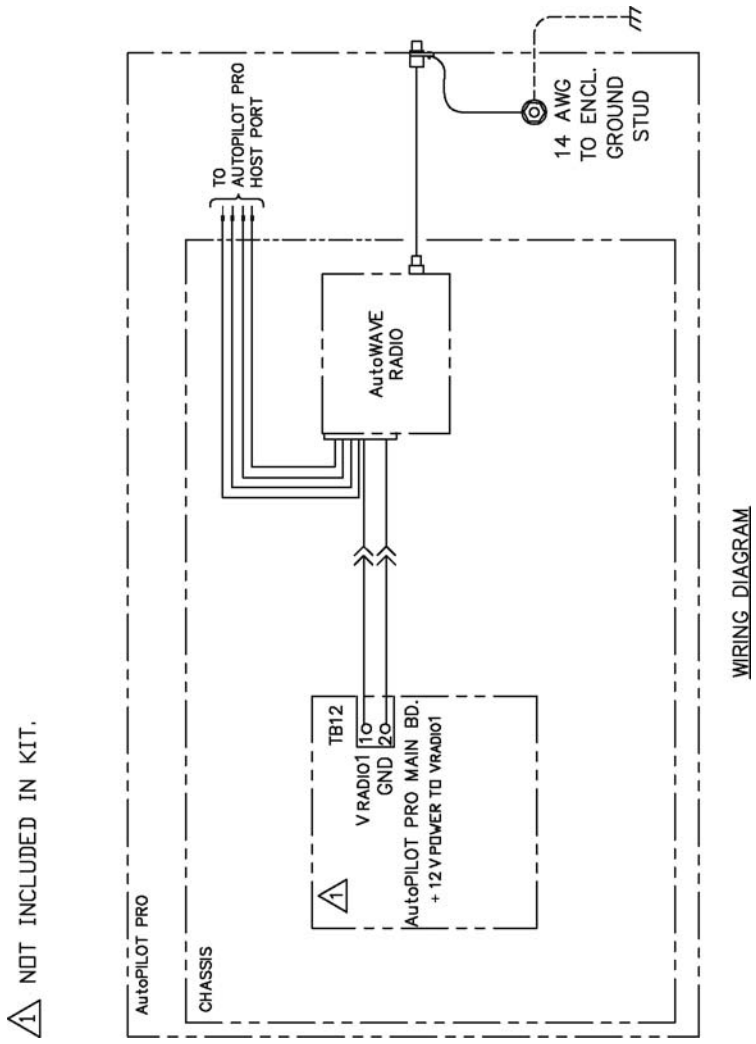


Figure D–37. 3-0500-073: AutoWAVE radio ready wiring diagram

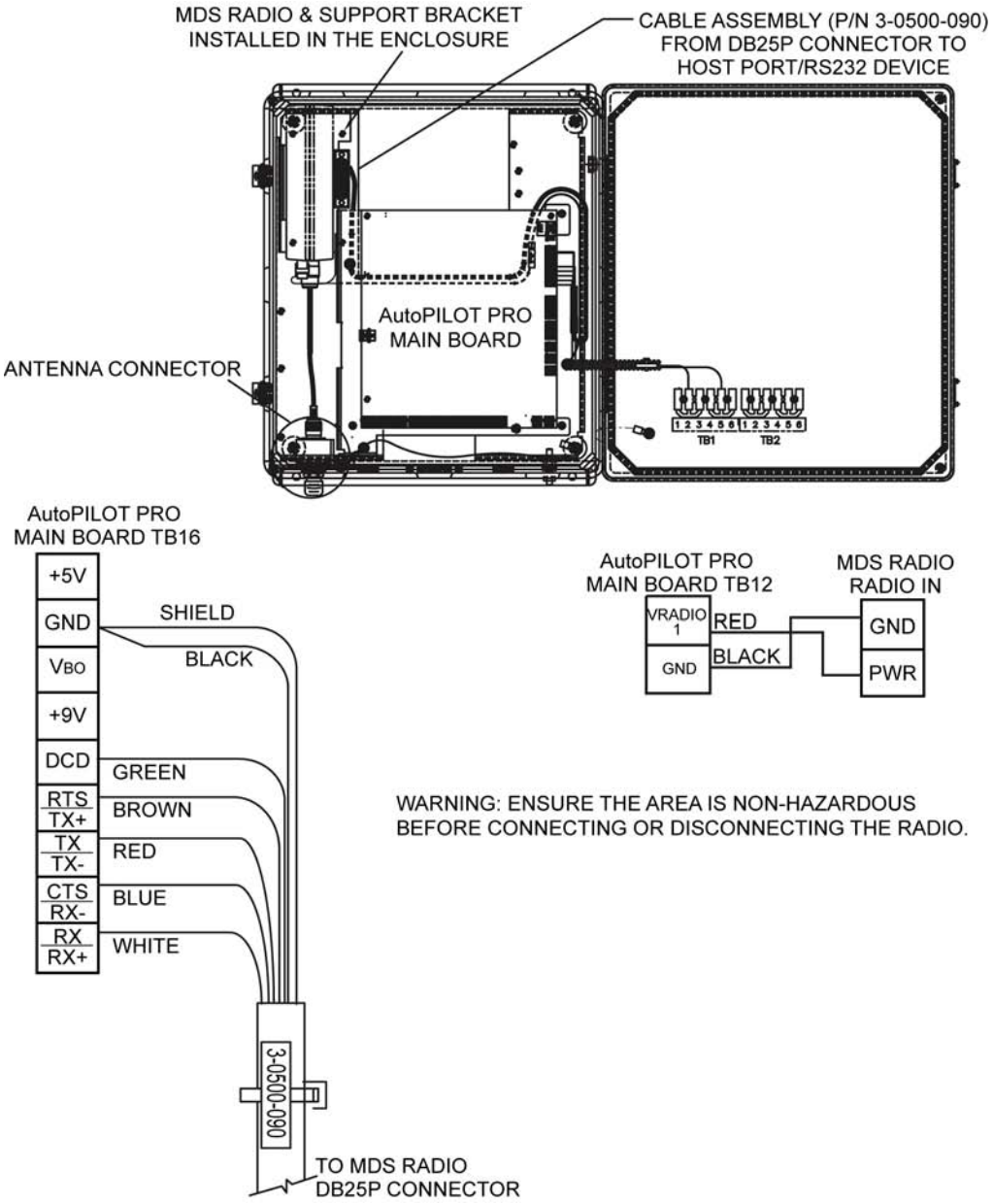


Figure D–38. MDS radio installation and wiring

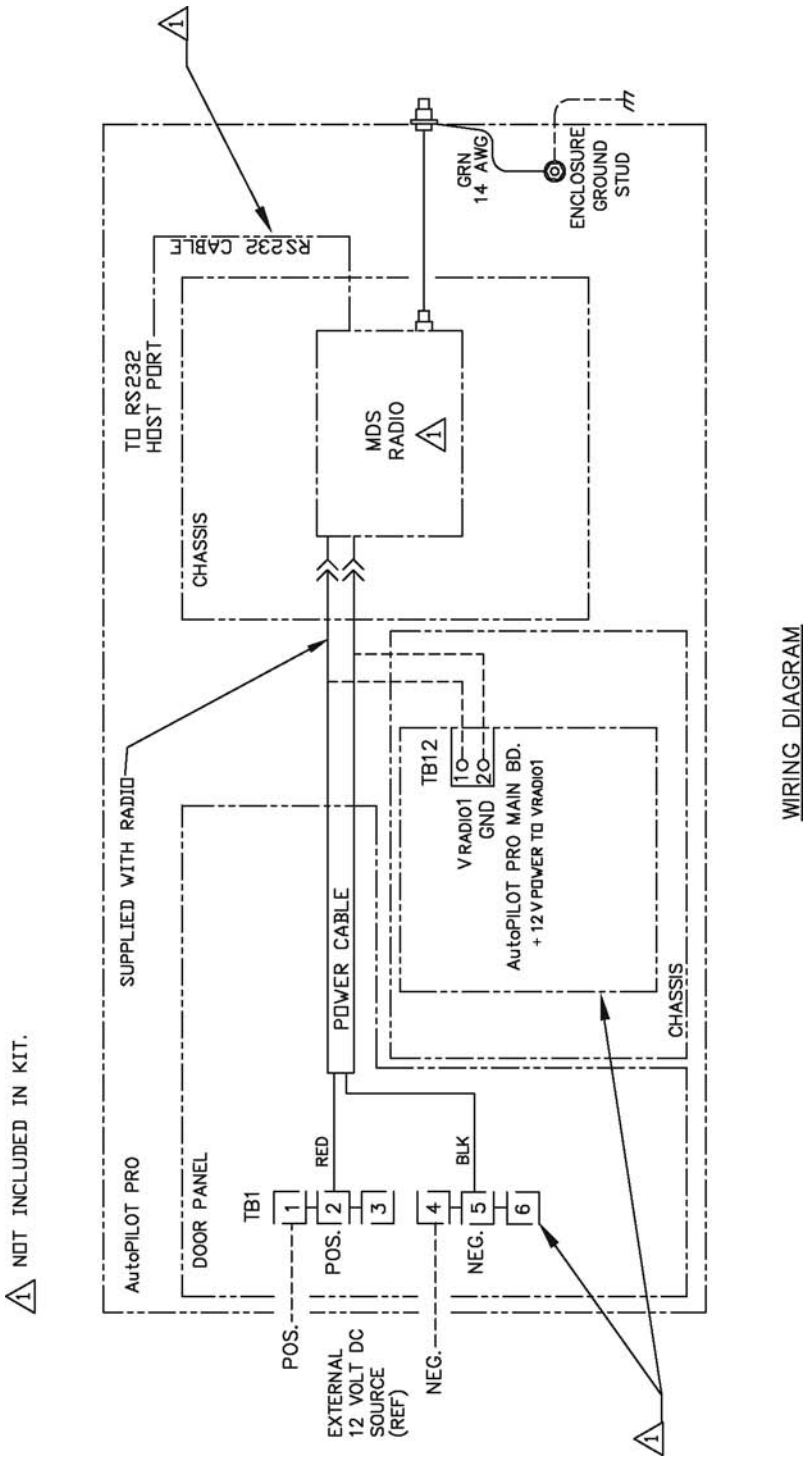


Figure D–39. 3-0500-081: MDS wiring diagram for radio ready kit

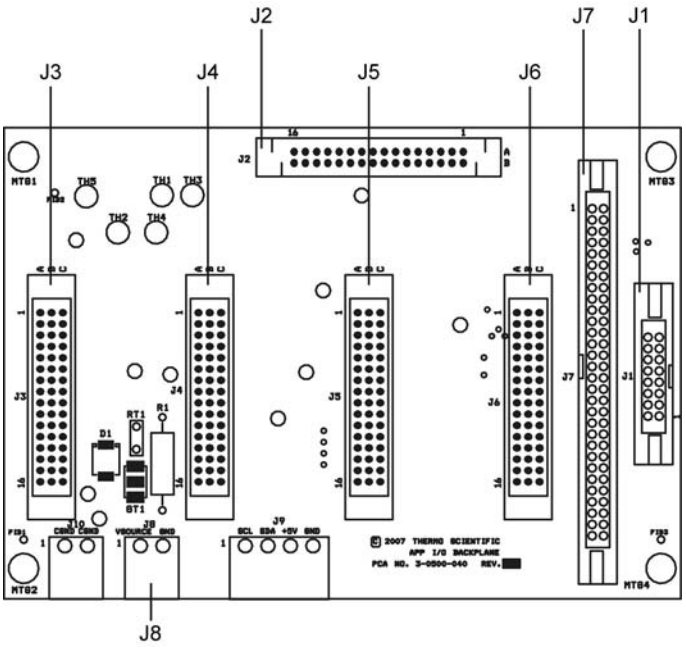


Figure D–40. 4-0500-040: Connectors on the I/O expansion backplane

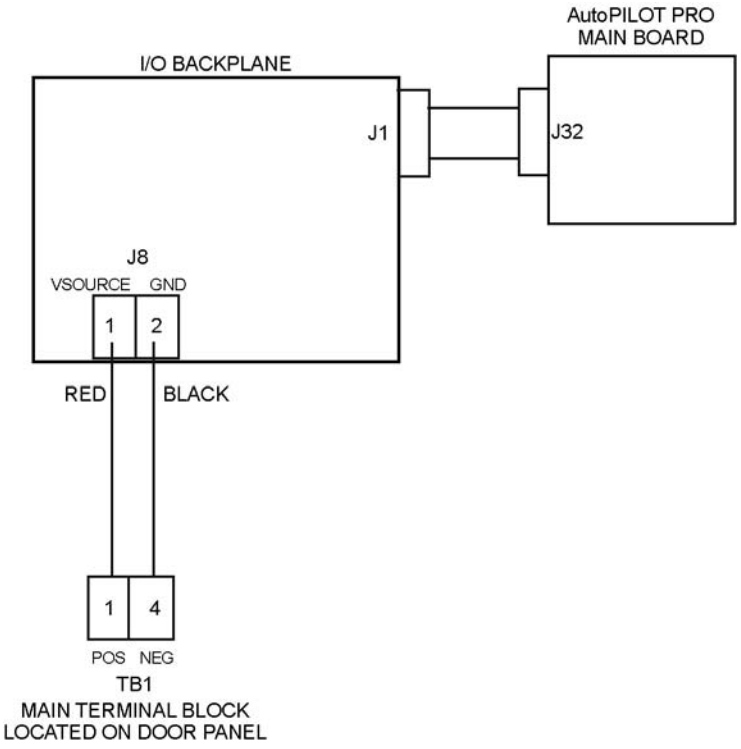


Figure D–41. 3-0500-026: Installing the I/O expansion backplane for the AI expansion option

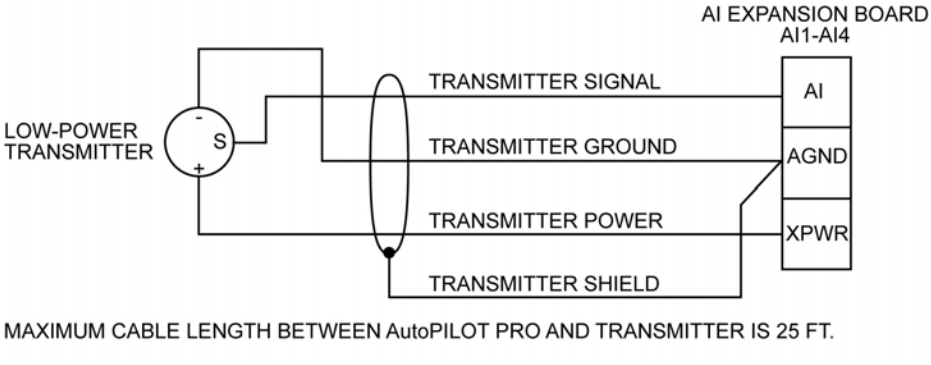


Figure D–42. Typical analog input wiring for AI expansion board

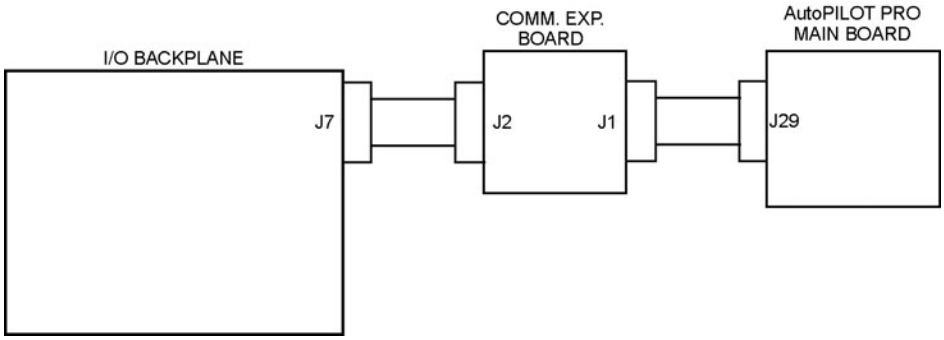


Figure D–43. Connecting the communication expansion board to the I/O expansion backplane and the AutoPILOT PRO main board

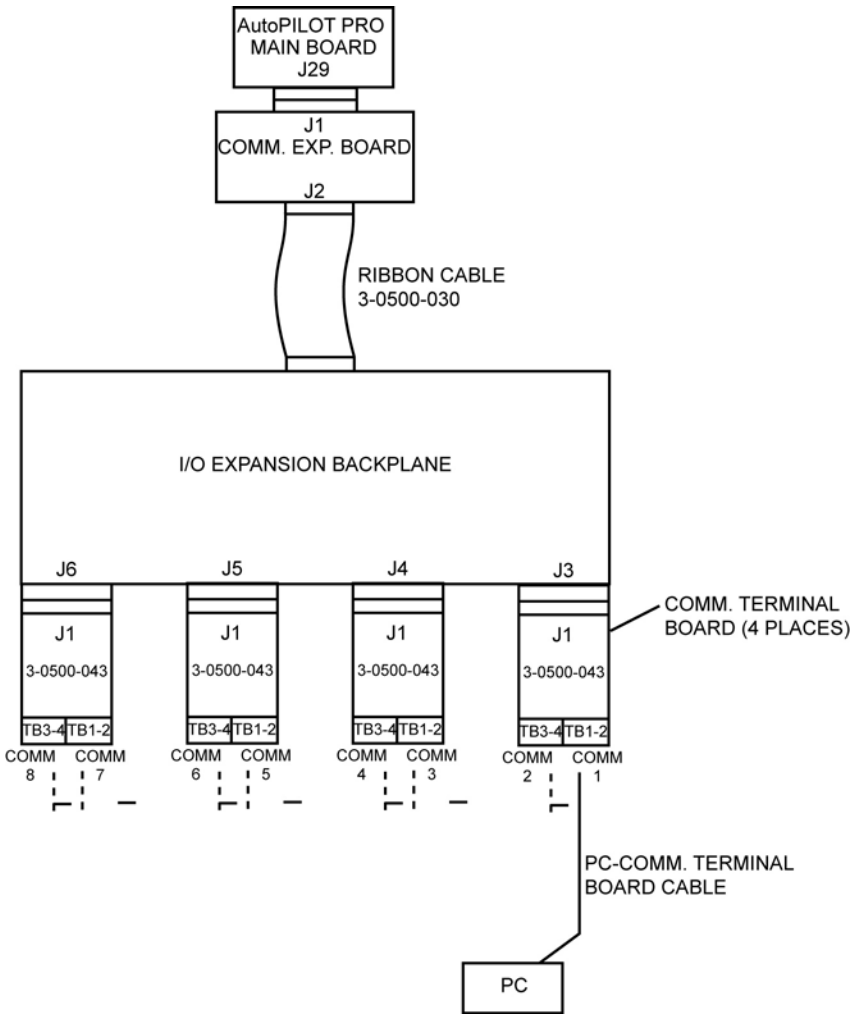


Figure D–44. System setup for RS232 mode

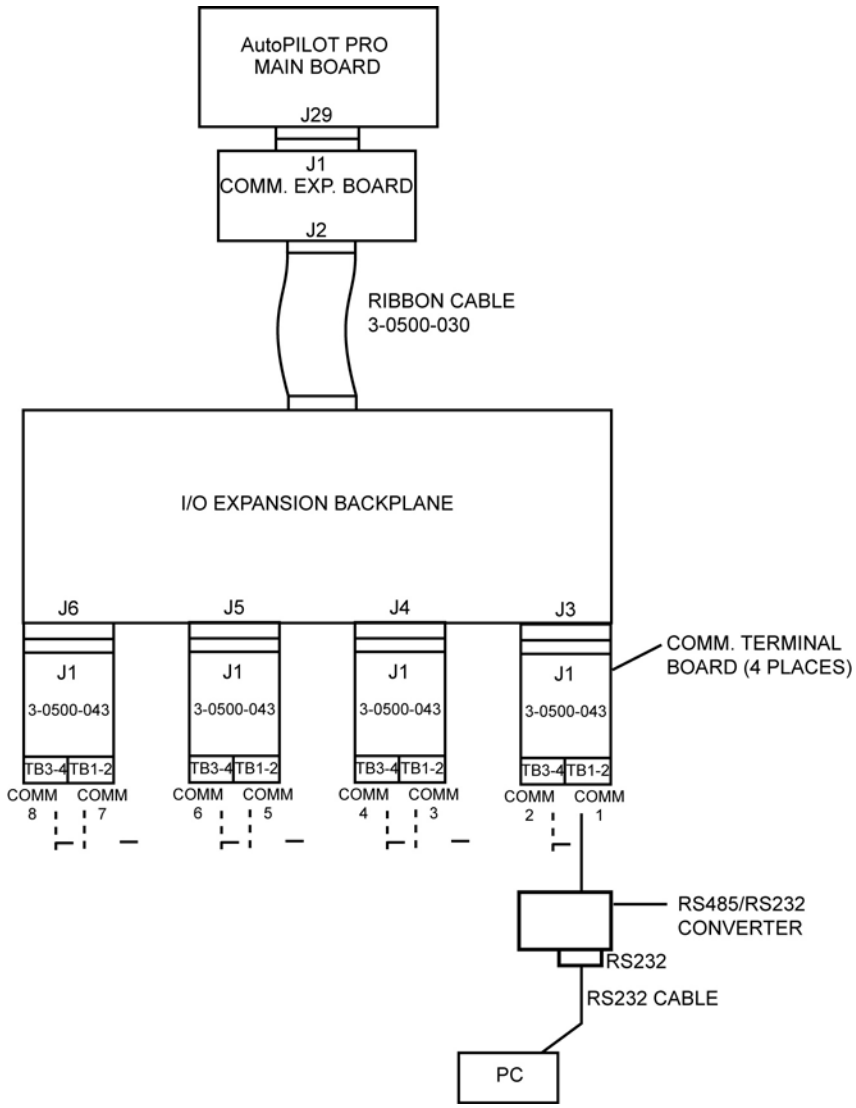


Figure D–45. System setup for RS485 mode

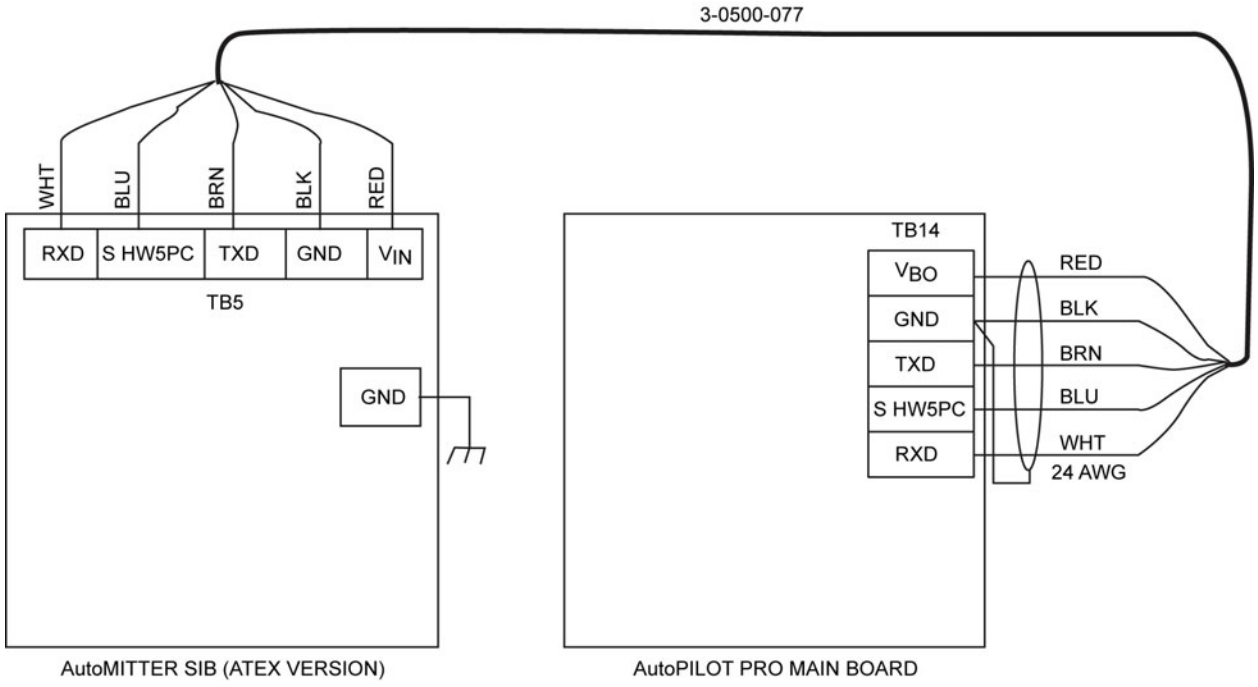


Figure D–46. AutoMITTER SIB to AutoPILOT PRO flow computer wiring, ATEX/Brazilian installations

AutoMITTER PRO
Electrical Ratings: 6 VDC
Enclosure Type, IP54
Cat I Zone 0 Groups IIB
Temperature Code T4 (135ºC)
Ambient Temperature Range: -40 ºC to +80 ºC

System Connections:
Power Supply Source: 6 VDC
One Honeywell Smart Multivariable Transducer SMV3000 or SMV2000 series with maximum pressure rating of 4500 psi for each of the AutoMITTER Pro units.

NOTES: UNLESS OTHERWISE SPECIFIED.

1. USE 18 AWG WIRE FOR Vo1 TO Vo4 & GROUND, MAX. CABLE LENGTH 100 FT.
2. ALL WIRING TO AND FROM AutoMITTER PRO IS INTRINSICALLY SAFE WIRING.
3. COLOR CODING SHOWN FOR SYSTEMS CONNECTION USING RTD EXTENSION CABLE TO AutoPILOT RTD ASSEMBLY. REFER TO AutoMITTER PRO USER MANUAL FOR CONNECTIONS TO OTHER DEVICES.

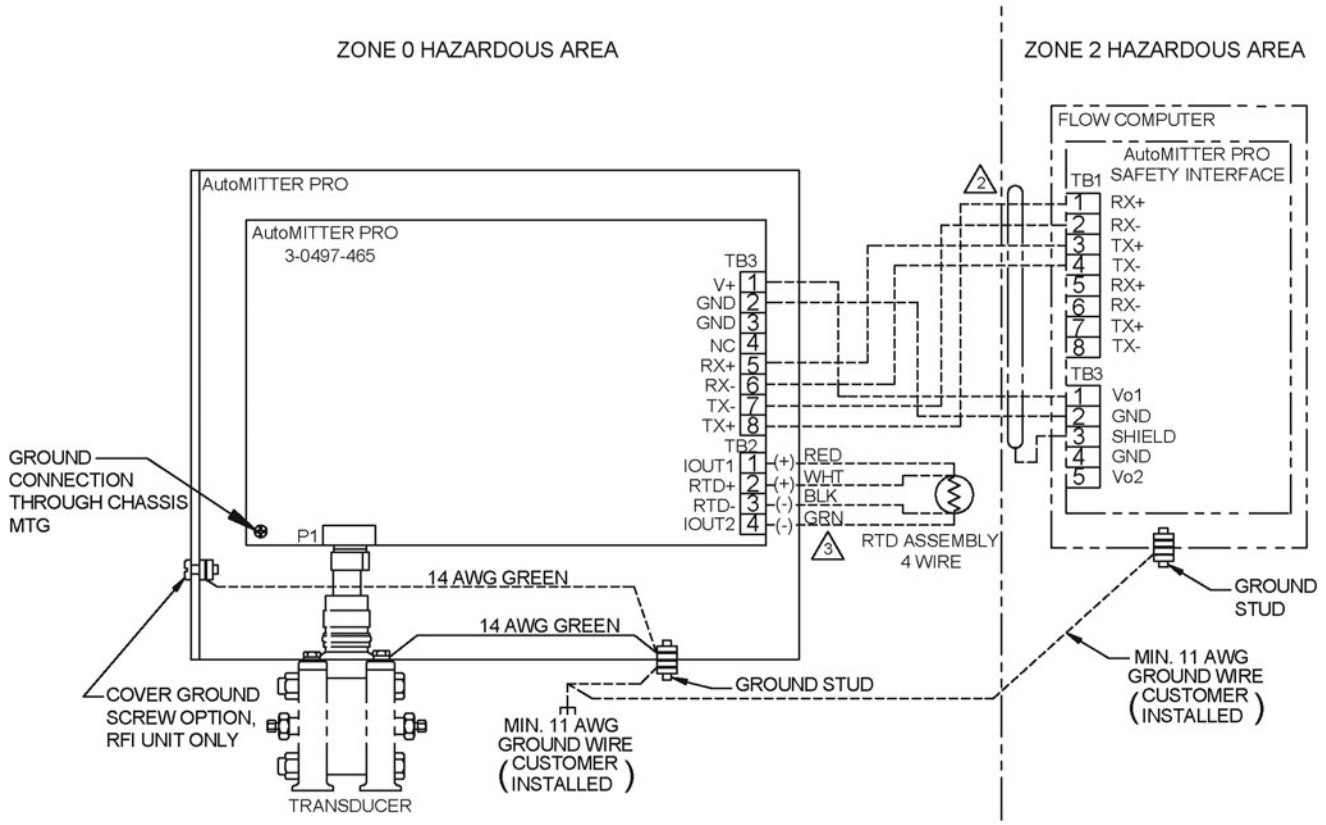


Figure D–47. 0-0497-516: AutoMITTER PRO transmitter wiring diagram, ATEX/Brazilian installations (sheet 1 of 2)

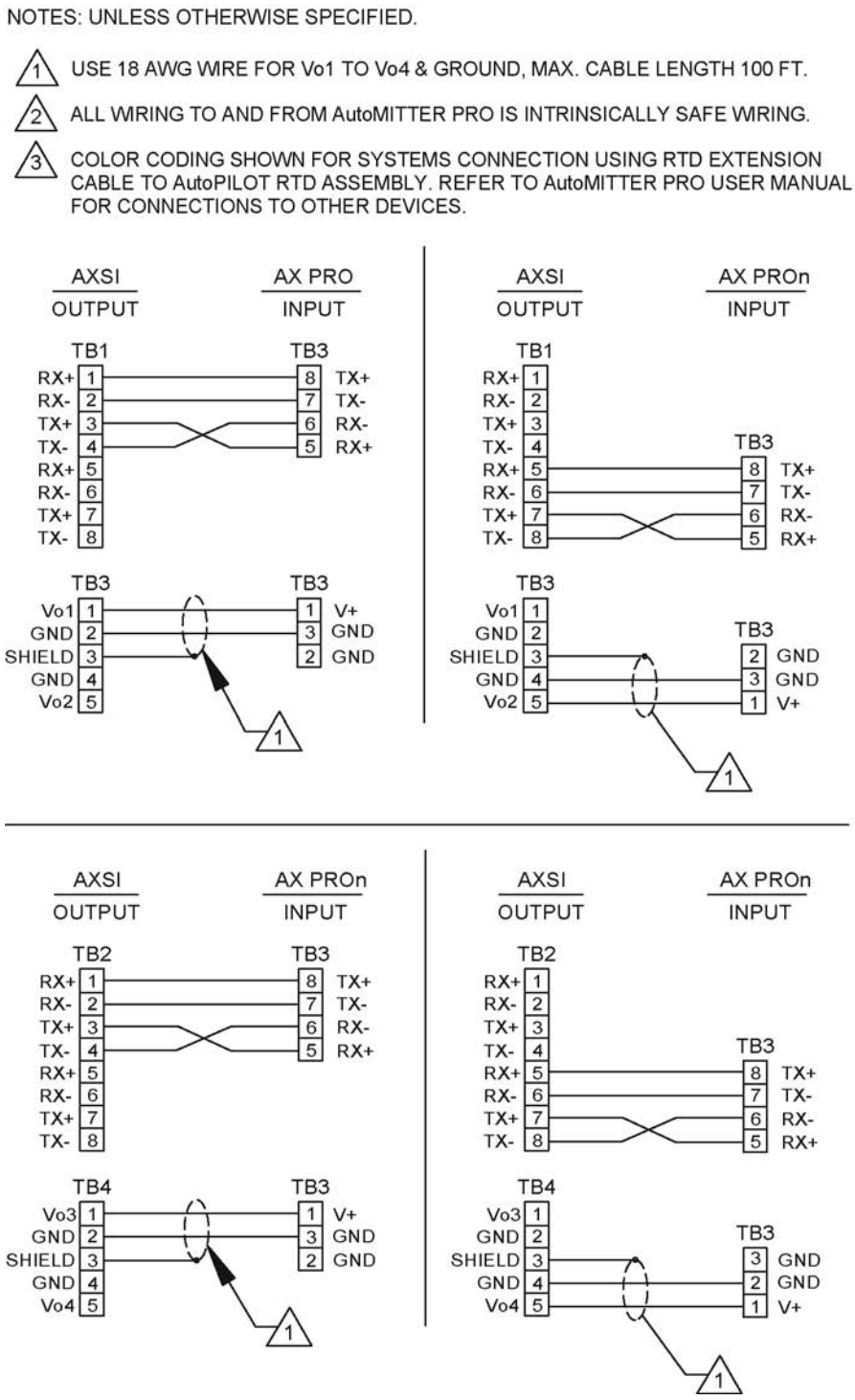


Figure D–48. 0-0497-516: AutoMITTER PRO transmitter wiring diagram, ATEX/Brazilian installations (sheet 2 of 2)

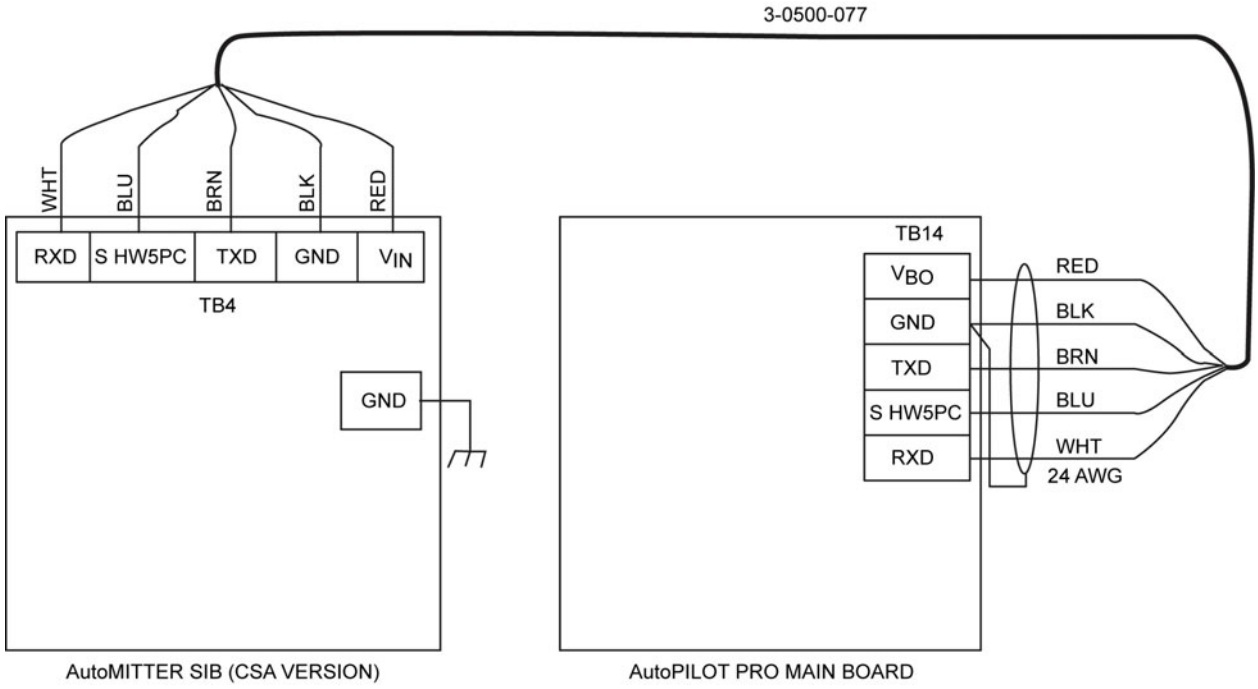


Figure D–49. AutoMITTER SIB to AutoPILOT PRO flow computer wiring, CSA version

NOTES: UNLESS OTHERWISE SPECIFIED.

1. ALL WIRING TO AND FROM AutoMITTER PRO IS INTRINSICALLY SAFE WIRING AND MUST BE MADE ACCORDING TO ARTICLE 504 (INTRINSICALLY SAFE SYSTEMS) OF THE NATIONAL ELECTRICAL CODE, NFPA70; OR SECTION 18-066 AND 18-106 OF THE CANADIAN ELECTRICAL CODE. MULTIPLE CIRCUITS THAT RUN IN THE SAME MULTIPLE-CONDUCTOR CABLE MUST HAVE A MINIMUM INSULATION THICKNESS OF 0.01" (0.25mm) ON EACH CONDUCTOR.

2. COLOR CODING SHOWN FOR SYSTEM CONNECTION USING RTD EXTENSION CABLE TO AutoPILOT RTD ASSEMBLY. REFER TO AutoMITTER PRO USER MANUAL FOR CONNECTIONS TO OTHER DEVICES.

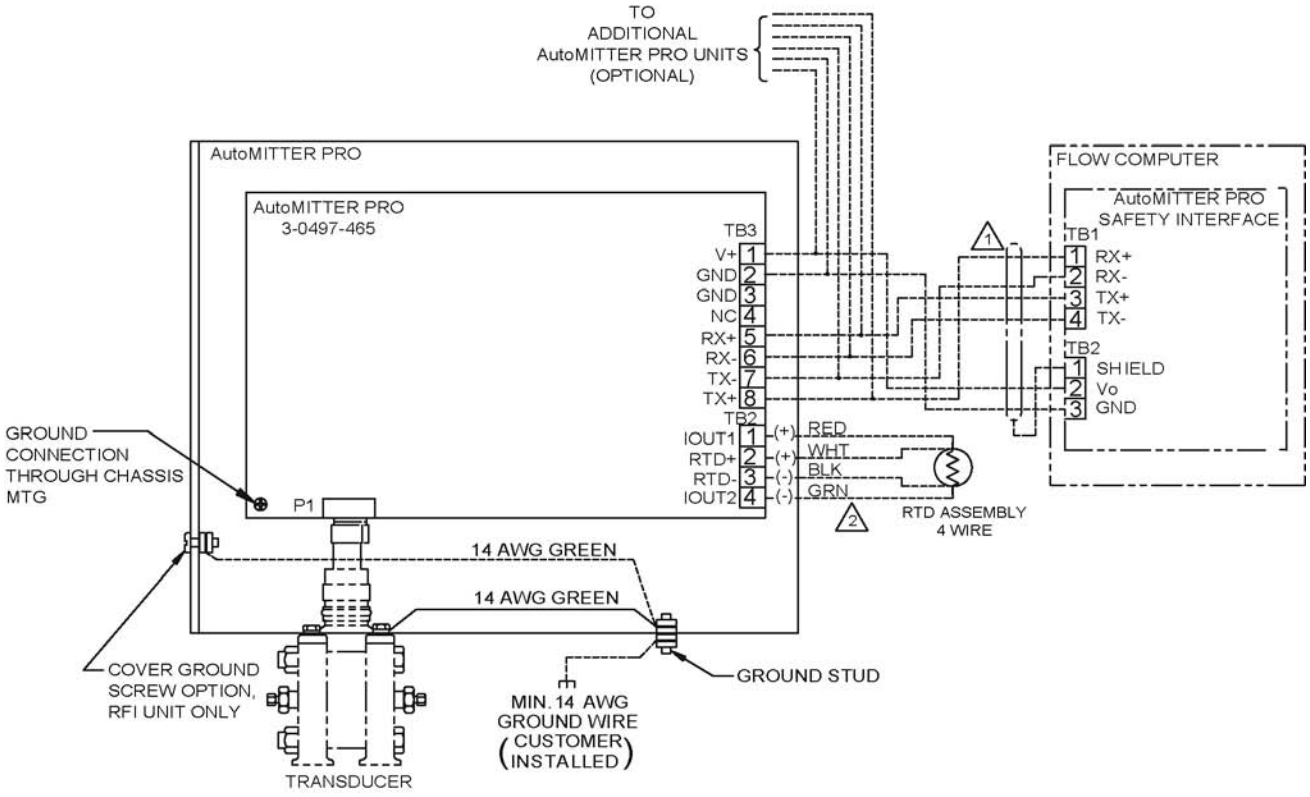


Figure D–50. 0-0497-517: AutoMITTER PRO transmitter wiring diagram, CSA version

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